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Blood Loss at Caesarean Section: A Five-Year Single Centre Experience in the Niger Delta

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Authors' contributions

This work was carried out in collaboration between the two authors. Author EHI designed the study, performed the statistical analysis. Author AOA wrote the Abstract, Introduction, protocol, and wrote the first draft of the manuscript. Author AOA managed the analyses of the study. Author AOA managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Objective: The objective of this study is to review outcomes of our caesarean delivery in terms of:
- amount of intraoperative blood loss and whether this compares favourably with blood loss at other centres.
- to compare the effects various calibers of surgeons and experience impact on blood loss at caesarean section.
- the effects unbooked emergencies impact on blood loss at caesarean section.
- the impact of the time spent by the surgeon on the degree of blood loss.
- the effect of fetal macrosomia, gestational age at caesarean delivery, previous caesarean section has on blood loss at caesarean section.
- to identify areas where improvements can be made.

Methodology: This was a descriptive, cross-sectional, retrospective study. This study was carried out at the Department of Obstetrics and Gynaecology, Niger Delta University Teaching Hospital, Okolobiri, Bayelsa state Nigeria. Eight hundred and forty eight subjects who delivered between

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January 2008 and January 2013 (both those who registered for antenatal care and those who were referred as emergencies) were recruited into the study. The records of the subjects for the study were extracted from their hospital files and the results so obtained coded into SPSS version 20 for analysis.

Results: The Mean blood loss at caesarean section for the study was 712.3 ml ± 389.5. There was no statistically significance difference between group means of blood loss by Consultants, Seniour Residents and Juniour Residents at Caesarean section as determined by one-way ANOVA (F.803= 1.252, P= .721 and .207). The mean time duration of surgery for the study was 63.57 ± 18.74 minutes. There was no statistically significant difference between the means of the time spent by Consultants, Seniour Residents and Juniour Residents as determined by the Oneway ANOVA test (F 1.021= -801, P= .444, .787).

Conclusion: Unbooked emergencies contributed so much to the degree of blood loss amongst other variable factors in this study. This is an issue that has plagued obstetric practice in sub-Saharan Africa and a major contributor to maternal morbidity and mortality. Caregivers and stake holders alike including governments, non-governmental organizations need to invest money and time including advocacy to reduce this ugly trend.

Keywords: Blood loss; Caesarean section; Calibre of surgeon; time duration of caesarean section; elective and emergency Caesarean setions; haemorrhage.

1. INTRODUCTION

Caesarean Section, the surgical act of delivering the baby by incising the anterior abdominal and uterine muscles has undergone tremendous revolutions since its inception in the times of Emperor Numa Pompilius of Rome –Lex Caesarea 715-673 BC [1]. Maternal mortality at inception then was almost 100%, from sepsis, haemorrhage and non-existent anesthesia. The discovery of antibiotics, blood transfusion, modern anaesthesia with the introduction of the lower segment caesarean section by Munro Kerr transformed Caesarean section and Obstetric Practice [1,2].

Currently, caesarean section is the most frequently performed operation in obstetric practice because of its safety [3,4]. However, haemorrhage continues to plague caesarean delivery especially those complicated by adhesion formation from previous abdominal surgeries including caesarean sections. Other causes of peripartum haemorrhage include placenta praevia, morbidly adherent placenta, obstructed labour, previous abdominal myomectomy, the presence of fibroids in the lower uterine segment [5]. The skill of the surgeon and the mode of anaesthesia used for the surgery also contribute to intraoperative haemorrhage. Obstetric haemorrhage is a leading cause of maternal mortality both in developing and developed countries [6]. Efforts are ongoing with clinical trials of prior administration of tranexamic acid to patients undergoing caesarean section to reduce blood loss [7].

Blood loss of ≥ 1,000 ml is regarded as excessive intraoperative haemorrhage [8,9] or any amount of blood loss that is able to compromise the haemodynamics of the patient.

Quantification of blood loss at caesarean delivery is, therefore, necessary for an adequate replacement to preserve the haemodynamics of the patient.

There is not yet an accurate clinical technique for the quantification of blood loss at caesarean section [10].

Traditionally, blood loss at caesarean section is estimated by reading the volume of blood collected into graduated jars and bottles of suction machines. Additional estimation of blood loss is made by recording the number of soaked standard abdominal towels plus the visual estimation of blood soaked in linens used for the surgery. However, this method is associated with high degree of underestimation of blood loss [10,11,12]. Most times, there is a discrepancy between estimated blood loss between the Surgeon and Anaesthetist that impacts negatively on prompt treatment of intrapartum haemorrhage [10].

There is ongoing research, whether prior clinical education course on visual estimation can improve the accuracy of the measurement of blood loss [13].

The goal of this study is to observe the determinants of intraoperative haemorrhage at cesarean section and to see how it impacts on patient care.

2. METHODOLOGY

The study was carried out in the Niger Delta University Teaching Hospital, Okolobiri, Bayelsa state, Southern Nigerian. It was a cross-sectional retrospective study of 848 Subjects who delivered by caesarean section at this centre between first January 2008 to January 2013. Both booked and unbooked antenatal patients who underwent elective or emergency caesarean delivery within the study period were included in the study. Excluded from the study were those with diagnosed haemostatic and coagulation problems. Ethical Committee approval was obtained specifically for the privacy of patients used for the study.

The data was collected from the labour ward and theatre records of subjects recruited for the study. Information sought from the records includes the social demographic characteristics of subjects, mean blood loss at caesarean section, and the proficiency of the surgeon with regards to blood loss and duration of surgery. The indication[s] for surgery, the booking status of the patient, elective or emergency operations, the number of previous caesarean section(s), baby's weight, gestation at delivery, mean units of blood transfused and 48-hour postoperative haematocrit.

The conventional method of recording blood loss at the centre was used for the study. The Anaesthetist and the Obstetrician independently estimate their various blood losses after the surgery and the values are added for an average to be calculated. This average is then recorded in the operating notes as a single value.

The blood loss at surgery was estimated by a combination of factors: The abdominal towels used by the Obstetrician during the surgery are each held up by a sponge holding forceps, any of these towels fully soaked with blood but not dripping is said to hold 120 ml of blood while that which is dripping with blood is said to hold 150 ml of blood. The blood collected directly into suction machine bottles is measured directly. The blood that accumulated in the vagina during the surgery is collected into graduated metallic jars. The blood that spilled into linen (if enough) is also scooped into a graduated jar. The blood that is soaked in linen is visually estimated. All the various blood losses are summed up to give the estimated blood loss. The level of statistical significance for the study was set at 95% confidence interval [$p<0.05$].

Data was collected and coded into SPSS version 20 for windows. Data obtained were presented as numbers with percentages, and ranges. The results were analyzed using Means ± SD, Pearson Chi Square tests, Regression analysis. P-value of < 0.05 was considered statistically significant.

3. RESULTS

Eight hundred and forty eight subjects who delivered by caesarean section during the study period were enrolled for the study. The mean maternal age was 28.8 ± 6.2 years, the minimum age was 15 years, and the maximum age was 43 years. Sixty subjects [7.1%] were under 19 years and 119 [14.0%] were between 20-24 years. The mean parity for the study population was 2.9 ± 2.0. Primigravidae were 344 [40.5%], Para 1-2 were 288 [33.9%]. Education - One hundred and thirty-two [15.7%] had primary education, 432 [50.9%] had secondary education. Three hundred and forty-eight [41.0%] were booked while 500 [59.0%] were unbooked antenatal clients. Seven hundred and sixteen [84.4%] had a primary caesarean section, 92[10.8%] had one previous caesarean section. Seven hundred and sixty-four [90.1%] had no comorbid condition during the antenatal period while 84[9.9%] had one form of issue or the other during the same period.

See Table 1 for blood loss analysed in terms of age, parity, education, booking status and complications of subjects.

The Mean blood loss at caesarean section for the study was 712.3 ml ± 389.5. The mean blood loss for the surgeries performed by Consultants was 711.8 ± 315.9, the mean blood loss by the Seniour Residents was 715.5ml ± 476.4 ml while the blood loss for the Juniour Residents was 708.8 ± 346.1 ml. There was no statistically significance difference between group means of blood loss by Consultants, Seniour Registrars and registrars at Caesarean section as determined by one-way ANOVA [$F.803= 1.252$, $P= .721$ and $.207$]. See Table 2 for numbers of caesarean sections, patient blood loss while being operated by the various cadres of Obstetricians.

Table 1. Maternal Socio-demographic distribution and blood loss during caesarean section

Description	No. of C/S	%	Blood loss < 1000 ml	%	Blood loss >1000 ml	%	Chi-Square (X^2)	Df	P-value
Age range:									
<19	60	7.1	60	7.1	0	0.0	93.3	4	0.000
20-24years	119	14.0	115	13.5	4	0.4			
25-29years	288	33.9	253	29.8	35	4.1			
30-34years	200	23.5	190	22.4	10	1.1			
≥35	181	21.3	122	14.3	59	6.9			
Parity:									
Para 0	344	40.5	320	37.7	24	2.8	143.005	2	0.000
Para 1-2	288	33.9	268	31.6	20	2.3			
Para 3-4	136	16.0	116	13.6	20	2.3			
Para 5-6	44	5.1	16	1.8	28	3.3			
Para 7-8	20	2.3	8	0.9	12	1.4			
Para 9-10	16	1.8	12	1.4	4	0.4			
Educational level:									
No education	8	0.9	4	0.4	4	0.4	25.527	3	0.000
Primary	132	15.5	120	14.1	12	1.4			
Secondary	432	50.9	392	46.2	40	4.7			
Tertiary	276	32.5	224	26.4	52	6.1			
Booking status:									
Booked	348	41.0	320	37.7	28	3.3	11.681	1	0.001
Unbooked	500	58.9	420	49.5	80	9.4			
Previous C/S:									
Primary	716	84.4	616	72.6	100	11.7	8.165	3	0.043
One previous	92	10.8	84	9.9	8	0.9			
Two previous	16	1.8	16	1.8	0	0.0			
Three previous	24	2.8	24	2.8	0	0.0			
Antenatal complication:									
Nil	764	90.1	664	78.3	100	11.8	0.866	1	0.352
Present	84	9.9	76		8				

At 95% confidence interval, there was a statistical significant relationship between maternal age (P = 0.000), Parity (P = 0.000), educational level (P = 0.000), booking status (P = 0.001), previous caesarean section (P = 0.043) and blood loss. No statistical significant relationship was observed between presence of complication during antenatal and blood loss during surgery (P = 0.352)

Table 2. Category of surgeon and blood loss during caesarean section

Variable	No. of C/S	%	Blood loss < 1000 ml	%	Blood loss >1000 ml	%	Chi-square (X^2)	Df	P-value
Calibre of surgeon:									
Junior Resident	252	29.7	220	25.9	32	3.7	3.200	2	0.202
Senior Resident	308	36.3	276	32.5	32	3.7			
Consultant	288	33.9	244	28.7	44	5.1			

The mean time duration of surgery for the study was 63.5 ± 18.7 minutes. The mean time duration of surgery by Consultants was 62.7 ± 20.1 minutes, Seniour Residents mean time duration of surgery was 63.73 ± 19.47 minutes and the mean duration of surgery for Juniour Residens was 64.2 ± 16.1 minutes.

There was no statistically significance difference between group means of duration of caesarean section by Consultants, Seniour Registrars and registrars as determined by one-way ANOVA test (F.803= 1.021 =.801, P= .444 and .787.

The indications for caesarean sections and the amount of blood loss attributed to them are as follows: Twenty [2.4%] were done for abnormal lie, 71 [8.4%)] for breech presentation, and 289 [34.1%] were done for cephalopelvic disproportion in labour. See Table 3 for indications for caesaren sections and blood loss attributed to them.

Sixty babaies [7.0%] weighed below 2,5 kg while 660 [77.8] weighed between 2.5 – 3.9 kg.

One hundred and thirty five [15.9%] babies were delivered at a gestational age less than 37 weeks while 693 [81.7%] babies were delivered between the gestational ages between 37- 41 weeks.

Table 5 shows the influence of birth weight and gestationa at caesarean section and blood lossassociated with them.

4. DISCUSSION

One in five [1:5] women in our study were of advanced maternal age. Women globally and in Nigeria tend to delay childbearing until advanced maternal age because of educational pursuit [14,15]. The benefits of education cannot be underrated, however, advanced age of the prospective mother predisposes to both increased tendencies towards medical disorders and post-partum haemorrhage [16,17]. There was a statistically significant relationship between maternal age and blood loss in this study. This is consistent with a large retrospective study done in Tochigi, Japan where maternal age ≥ 35 years was an independent risk factor for blood loss at parturition irrespective of the mode of delivery [17]. There was an association between high parity, numbers of previous caesareans and tendency towards intrapartum haemorrhage in the study and this is in agreement with studies done in Saudi Arabia [18] and Port-Harcourt, Nigeria respectively [18,19]. However, these results were different from another Saudi Arabian study [20] where there was no statistical significance between higher order caesarean sections and intraoperative blood loss [20].

The educational attainment of subjects in the study was very high. Globally, high educational status is associated with high knowledge of antenatal care issues and the utilization of health care services [21,22]. There was a statistical significance between maternal educational status and the degree of intrapartum blood loss at caesarean section for this study.

The mean blood loss at caesarean operations for this study was higher than studies in Pakistan with a mean blood loss of 592 ml [9] and that of the joint Egyptian and Saudi Arabia with a mean blood loss of 539 ml [12]. These differences in the blood loss may be explained by the preponderance of emergency to elective caesarean sections in our study of 82.7% to 17.3% respectively to that of Pakistan study where 34% were emergency and 66 % elective caesarean sections [9]. All subjects recruited for the Egyptian study had elective caesarean sections. Substantial evidence abounds that emergency caesarean section is associated with more maternal morbidity and mortality, haemorrhage inclusive, compared with elective caesarean section [19,23,24,25]. Elective caesarean section cases do not only have better preoperative preparations and outcome, the majority of subjects in our study were unbooked emergencies with many of obstetric complications and tendency towards obstetric haemorrhage [26,27]. There was statistical significance in intrapartum haemorrhage between booked and unbooked patients in our study.

Our observed mean blood loss compares favourably with global standards of ≥ 1,000 ml being defined as excessive intraoperative haemorrhage.

The mean operating time for caesarean section in this study was 63.6 ± 18.74 minutes. There was a positive correlation between blood loss and duration of operation in our study [At r = 1, p = 0.000,]. This were comparable with a study done in Australia where the operating time was between 30-60 minutes [29]. The time duration for caesarean may have been extended in our study due to the fact that the indication for caesarean section in a sizeable proportion of subjects was cephalopelvic disproportion and obstructed labour respectively. These are subjects with various degrees of disproportion and obstruction in labour who had emergency caesarean delivery including referred and unbooked emergencies. The operating time for these cases is not only longer but also associated with a concomitant degree of blood loss [28,29].

Table 3. Correlation between mean blood loss at caesarean section and mean duration of surgery

S/N	Category of surgeon	No. of C/S	%	Type of C/S elective	%	Emergency caesarean section	%	Mean blood loss (ml)	Mean duration of surgery (Mins)	r/p-value
1	Junior Resident	252	29.7	6	0.7	246	29.0	708.8 ± 346.1	64.2± 16.1	
2	Senior Resident	308	36.3	38	4.5	270	31.8	715.5 ± 476.4	63.7 ±19.4	1 (0.000)
3	Consultant	288	33.9	103	12.1	185	21.8	711.8 ± 315.9	62.7± 20.1	
Total/Mean		848	100	147	17.3	701	82.7	712 ± 389.5	63.5± 18.7	848

At r = 1, p = 0.000, there was a statistically significant relationship and a correlation between blood loss and duration of surgery

Table 4. Indications for caesarean sections and associated blood loss

Indication	Blood Loss <1000 mls		Blood Loss> 1000 mls		Total	
	Frequency	%	Frequency	%	Frequency	%
Abnormal lie	20	2.4	0	0%	20	2.4
Antepartum Haemorrhage	31	3.7	12	1.4	43	5.1
Breech presentation	67	7.9	4	0.5	71	8.4
Cephalopeivic disproportion	257	30.3	32	3.8	289	34.1
Fetal distress in labour	84	9.9	0	0.0	84	9.9
Pre-Eclampsia and Eclampsia	109	12.9	24	2.8	133	15.7
Failed Induction of Labour	8	0.9	9	1.1	17	2.0
Gestational Diabetes	4	0.5	16	1.9	20	2.4
Previous Caesarean Section	32	3. 8	11	1.3	43	5.1
Previous myomectomy	8	0.9	0	0.0	8	0.9
Obstructed labour	92	10.8	12	1.4	104	12.3
Cervical dystocia in labour	16	1.9	0	0.0	16	1.9
Total	728	85.8	120	14.2	848	100.0

Table 5. Fetal variables and blood loss during caesarean section

Variable	No. of C/S	%	Blood Loss < 1000 ml	%	Blood Loss >1000 ml	%	Chi-square (X^2)	Df	P-value
Birth weight:									
<2.5 kg	60	7.0	44	5.1	16	1.8	11.368	2	0.003
2.5-3.9 kg	660	77.8	584	68.8	76	8.9			
≥4 kg	128		112		16				
Gestational age:									
< 37	135	15.9	107	12.6	28	3.3	11.588	2	0.003
37-41	693	81.7	613	72.2	80	9.4			
> 42	20	2.3	20	20..3	0	0,0			

There was a statistically significant relationship between fetal variables and blood loss during caesarean section for both birth weight and gestational age (P = 0.003)

There was no statistical difference between junior, senior residents and consultant surgeons in terms of the degree of blood loss at caesarean section in the study. These results were comparable with a study done in Morocco where there was no difference in operating time and techniques based on the experience of the surgeon [30]. The resident is only allowed to be the lead surgeon in our centre if he has acquired such proficiency based on standards set by 'The West African College of Surgeons' the supervising authority for residency training in the sub-region [31]. However, the results are not in agreement with the study in North Western Nigeria and in the Bronx Lebanon Hospital, New York where there was a statistical difference in the degree of blood loss and the experience of the surgeon [27,32]. The results from North Western Nigeria may have differed from that in our centre because 25.7% of their subjects who had caesarean delivery were cases of obstructed labour [26] as compared to 10% of subjects who had obstructed labour at 'The Niger Delta University Teaching Hospital. In the Bronx Lebanon hospital study, the discrepancy may have been due to proficiency because both their estimated intraoperative blood loss and duration of surgery were in excess of the figures from our centre [32].

There was a statistically significant difference between the indications for caesarean section and the degree of intraoperative blood loss amongst subjects studied. Obstructed labour and its forerunner, cehaphalopelvic disproportion contributed 2:5 of the indications for caesarean section in our study. These results have been the trend in most of the sub-Saharan region [33,34]. The acute angle of pelvic inclination in the African woman delays entry of the fetal presenting part into the maternal pelvis in labour, often times culminating in cephalopelvic disproportion and obstructed labour [35]. Strenuous work in childhood years, nature, and nurture also contibutes to the formation of contracted pelvis [36]. All these issues among others lead to protracted labour with higher tendencies to intraoperative haemorrhage at cesarean section.

There was statistically significant variation between fetal weight and the amount of blood loss at caesarean section amongst study subjects. Fetal macrosomia is associated with intrapartum haemorrhage [37]. This may be due to large placentae with wide area of attachment to the uterine decidua which is prone to bleeding after its removal. The likelihood of uterine wound extension intraoperatively and associated haemorrhage is more with macrosomic babies than average sized ones.

There was also a statistically significant relationship between gestational age and degree of blood loss at caesarean section. This may be due to the fact that premature births are more prone to have adherent placetae that are more difficult to separate at delivery either by vaginal or caesarean delivery with concomitant haemorrhage. At the other extreme of gestational age beyond term fetal macrosomia with large placenta site and with a wider area of attachment are more prone to hemorrhage.

5. CONCLUSION

Many of the covariants of intraoperative blood loss tested statistically significant in our study. Though this was a single centre institutional study, and therefore, only limited generalization

can be made: however, the results of our audit have shown that perioperative blood loss is still an issue which will continue to plague caesarean delivery both in the sub-Saharan region and globally. The solution will rest on the ability of health institutions to improve and enlarge their capacity to handle obstetric emergencies especially the unbooked patients which featured prominently in this study. Stakeholders, Government and Non-Governmental Organizations, sub-regional and world bodies need to intervene to stem the tide of this factor that is a forerunner of maternal mortality and morbidity in Africa.

CONSENT

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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