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Anaesthesia for caesarean deliveries and maternal complications in a Nigerian teaching hospital.

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Abstract

Background: The aim of this audit was to evaluate the frequency of caesarean delivery, anaesthetic techniques employed, investigate potential trends and the rate of maternal complications associated with general or regional anaesthesia in our institution.

Methods: We reviewed data collected on all deliveries from patients' medical records, anaesthetic charts and relevant surgical notes from 1 January 2008 to 31 December 2010.

Results: A total of 10,911 deliveries were conducted during the study period and there were 3389 caesarean sections, giving a rate of 31.1%; which showed an upward trend from 27.8% in the first year to 34% in the third year. Our data showed a predominant use of regional anaesthesia for caesarean section generally (86.2%) and 83.8% for emergency caesarean deliveries in line with global trends. The overall complication rate was 10.5%. However, 34.5% of parturients who had general anaesthesia in contrast with 6.7% who had regional techniques had anaesthesia-related complications, postoperative intensive care unit admission rather than recovery room care, intra-operative cardiac arrest and haemorrhage exceeding 1200ml ($p = 0.001$). Haemodynamic fluctuations were the most common anaesthesia-related complication. Our data revealed that general anaesthesia was a significant risk factor for maternal complications.

Conclusion: Obstetric general anaesthesia is low in our hospital. Our result showed that general anaesthesia was a significant risk factor for maternal complications during caesarean section.

Keywords: *Caesarean deliveries; anaesthesia; maternal complications; risk factor.*

Résumé

Introduction: Le but de cet audit étaitd'évaluer la fréquence des accouchements par césarienne, les techniques anesthésiques employées, d'enquêter sur les tendances, le taux de complication maternelle associés à l'anesthésie générale ou régionale dans notre institution.

Méthodes: Nous avons passées en revue, un certain nombre de donnéesde tous les dossiers médicaux des patients pendant les accouchements, les graphiques anesthésiques et les notes chirurgicales pertinentes du 1er Janvier 2008 au 31 Décembre 2010.

Résultats: Au total 10,911 accouchements ontété accomplis pendant la période d'étude, un total de 3,389 césariennes, pour un taux de 31.1 %; une augmentation de 27.8 % de la première année à 34 % à la troisième année. Nos données ont montré une utilisation prédominante d'anesthésie régionale de la césarienne générale (86.2 %), et 83.8 % pour les césariennes d'urgence conformément aux tendances globales. Le taux de complication général est de 10.5 %. Pourtant, 34.5 % de parturientes qui avaient eu l'anesthésie générale par contraste avec 6.7 % qui avaient eu des techniques régionales avaient des complications concernant l'anesthésie, des service de soins intensifs post chirurgical dans l'unité d'admission plutôt que la salle des soins de récupération, l'arrêt cardiaque intra-chirurgical et l'hémorragie excédant 1200 millilitres ($p = 0.001$).

Conclusion: Les fluctuations hémodynamiques étaient la complication concernant l'anesthésie la plus commune. L'anesthésie obstétrique générale est faible dans notre hôpital. Nos données ont révélé que l'anesthésie générale était un facteur de risque significatif pour les complications maternelles durant la section césarienne.

Introduction

Whereas general anaesthesia (GA) was historically used for caesarean section (CS), regional blocks have been widely adopted in recent times [1,2]. Anaesthesia is recognized as a cause of maternal morbidity and mortality [3,4]. Neuraxial anaesthetic techniques offer numerous advantages over GA such as a better safety profile, reliability and allows the mother, being awake, to be a part of the birthing experience. Research studies in Nigeria document change in the anaesthetic practice from GA as the preferred technique from 2002-2005, but the percentage use of GA remained high [3,5,6]. There are few recent publications in our practice environment on caesarean section rate, obstetric

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anaesthetic practice and anaesthetic maternal complications. The aim of this audit was to evaluate the frequency of caesarean delivery, anaesthetic techniques employed, investigate potential trends and the rate of maternal complications associated with general or regional anaesthesia in our institution.

Anaesthesia-related complications referred to delayed recovery from GA, inadequate spinal anaesthesia, haemodynamic fluctuations, airway problems such as difficult/failed intubation and post anaesthesia shivering. For patients who were tachycardic or hypertensive preoperatively, we employed 25% difference from the baseline. We

Table 1: Total deliveries, caesarean deliveries and anaesthetic technique per year

Year	Total Deliveries	CS	CS rate(%)	GA, n (%)	RA, n (%)
2008	3,712	1031	27.8	141 (14)	890 (86)
2009	3,694	1166	31.6	168 (14)	998 (86)
2010	3,505	1192	34.0	160 (13)	1032 (87)
Total	10,911	3389	31.1	469 (13.8)	2920 (86.2)

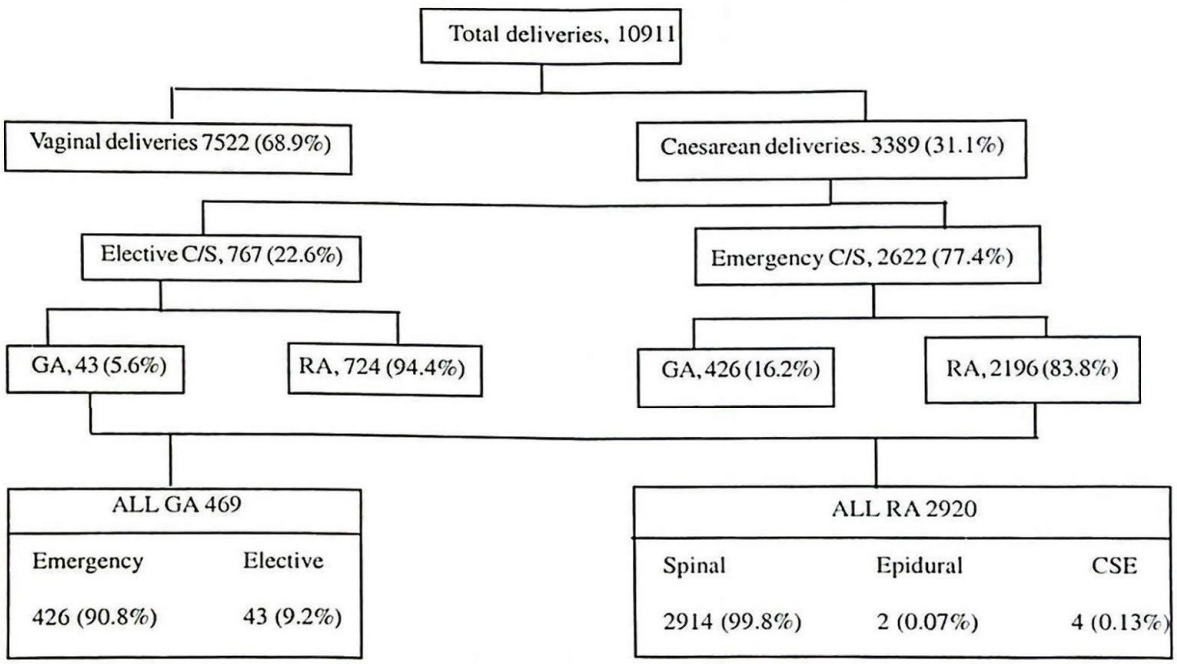

Fig. 1: Flow diagram showing total deliveries, caesarean sections and the different anaesthetic techniques used.

Materials and methods

After obtaining approval from the Institutional Ethics Committee, data were collected on all deliveries at the University College Hospital, Ibadan, (including caesarean section) from patients' medical records, anaesthetic records and relevant surgical notes from 1 January 2008 to 31 December 2010. A data extraction form was developed for the collection of information such as age, technique of anaesthesia employed and maternal complications. The categories of complications were anaesthesia-related, intensive care unit (ICU) admission postoperatively rather than recovery room care, intraoperative cardiac arrest/ death and haemorrhage exceeding 1200ml. looked at haemorrhage $\geq$ 1200ml and recorded blood transfusions. Data were analyzed using the Statistical Package for Social Sciences (SPSS, Chicago, IL) version 17.0 and summarized using proportions. The risk of developing complications for the type of anaesthesia and the type of caesarean section (emergency CS versus elective CS) together with their risk ratios and 95% confidence intervals were calculated using open source Epidemiologic Statistics for Public Health [7].

Results

During the study period, 10,911 deliveries were conducted and there were 3389 caesarean sections,

giving a rate of 31.1%. From 27.8% in 2008, 31.6% in 2009 and 34% in 2010, our caesarean delivery rates showed an upward trend (Table 1). The number of deliveries, caesarean sections and the different anaesthetic techniques used are shown in Figure 1. There is a predominant use of regional techniques (86.2%) during the study period as shown in Table 1.

Thiopenthal (200 – 500mg) was the only induction agent administered for GA during the study period while different combinations were employed for the 2914 spinal anaesthesia: hyperbaric bupivacaine alone (12.5 – 15mg), 1620 (55.6%); hyperbaric bupivacaine (10 – 15mg) with fentanyl 15mcg, 1284 (44.03%); isobaric bupivacaine 12.5mg alone, 2 (0.07%) and isobaric bupivacaine 12.5mg with fentanyl 15mg, 8 (0.3%).

Maternal complications

The four categories of maternal complications were anaesthesia-related, ICU admission postoperatively rather than recovery room care, intraoperative cardiac arrest/death and haemorrhage exceeding 1200ml (Table 2). While the overall complication rate was 10.5%; 162 (34.5%) out of 469 parturients who had GA for CS had at least one form of complication during the study period.

related complications. There was more hypotension during GA than RA, especially at induction and for parturients who had tachycardia and hypertension pre-induction of anaesthesia, 25% difference from the baseline was employed. Overall, there was no statistical significance between emergency and elective anaesthesia-related complications (P=0.1). Forty parturients who presented with ruptured uterus, severe preeclampsia/eclampsia and abnormal placentations were admitted into the ICU after caesarean delivery due to their unstable clinical states rather than the recovery room. Intraoperative cardiac arrests/death occurred in 10 patients, 2 were placenta praevia type II under spinal block which was converted to GA following severe haemorrhage, another 2 had abruptio placentae, while the rest had severe pre-eclampsia/eclampsia. There was no statistically significant difference in the incidence of intraoperative cardiac arrest among those who had emergency CS and those who had elective CS {p=0.311, Fisher exact test}. However, there was significant association between postoperative intensive care unit admission rather than recovery room care and emergency caesarean section (p = 0.002). Furthermore, all the patients who had

Table 2: Incidence of maternal complications in different types of anaesthetic techniques for caesarean sections

Complications	All C/S n=3389	Emergency CS n=2622	Elective CS n=767	p-value'	GA n=469	RA n=2920	p-value*
Anaesthesia related	248(7.3)	181(6.9)	67(8.7)	0.1**	77(16.4)	171(5.9)	< 0.001
Post-op ICU admission	40(1.2)	40(1.5)	0	0.002**	37(7.9)	3(0.1)	< 0.001
Intra-op cardiac arrest	10(0.3)	10(0.4)	0	0.311[§]	8(1.7)	2(0.1)	< 0.001
Haemorrhage ≥ 1200ml	59(1.7)	50(1.9)	9(1.2)	0.227**	40(8.5)	19(0.7)	< 0.001
All complications	357(10.5)	281(10.7)	76(9.9)	0.57**	162(34.5)	195(6.7)	< 0.001

Data are n (%), p' value for comparison of proportion of complications between Emergency CS and Elective CS; p value for comparison of proportion of complications between GA and RA.*
*[§] Fisher exact test was used to estimate the p-value, **The p-value was determined by Yates corrected Chi square.*

Our results showed that although 469 (13.8%) parturients had obstetric general anaesthesia, there was a higher proportional complication with GA compared with RA in all the four categories of complications, p <0.001. Anaesthesia-related complications per technique; GA versus RA and the type of caesarean delivery are enumerated in Table 3 while the rate of maternal complications over the study period is highlighted in Table 4.

Haemodynamic fluctuations, such as, bradycardia, tachycardia, hypotension and hypertension, were the most common anaesthesia-intraoperative cardiac arrests and postoperative ICU admissions were emergencies (table 2).

Haemorrhage over 1,200mls occurred in 1.7% of all caesarean sections and blood transfusion was needed for 4.6% cases. Inadequate spinal anaesthesia occurred in 22 (1.0%) cases necessitating either repeating spinal block or conversion to GA. The strengths of association between the risk of developing maternal complications and the types of CS and anaesthetic techniques are shown in table 5. The risk of developing all or any of the categories of complications significantly increased with GA. For

Table 3: Anaesthesia-related complications per technique and type of CS.

Complications	GA	RA	Elective CS	Emergency CS
Delayed recovery from GA	19 (13.8)	-	8 (7)	11 (8.2)
Inadequate spinal anaesthesia	-	22 (20)	10 (8.7)	12 (9)
Airway difficulties	7 (5.1)	-	3 (2.6)	4 (3)
Post anaesthesia rigors	8 (5.8)	9 (8.2)	7 (6.1)	10 (7.5)
Bradycardia	7 (5.1)	9 (8.2)	6 (5.3)	10 (7.5)
Tachycardia	33 (23.9)	25 (22.7)	27 (23.7)	31 (23)
Hypotension	15 (10.9)	8 (7.3)	11 (9.7)	12 (9)
Hypertension	32 (23.1)	12 (10.9)	19 (16.7)	25 (18.7)
Pruritus	17 (12.3)	25 (22.7)	23 (20.2)	19 (14.1)
Total	138 (100)	110 (100)	114 (100)	134 (100)

Data are n (%).

Table 4: Anaesthesia-related complications per year

	2008		2009		2010		
Complications	GA	RA	GA	RA	GA	RA	Total
Delayed recovery from GA	9	-	6	-	4	-	19
Inadequate spinal anaesthesia	-	5	-	7	-	10	22
Airway difficulties	3	-	2	-	2	-	7
Post anaesthesia rigors	2	3	3	4	3	2	17
Bradycardia	2	3	3	4	2	2	16
Tachycardia	13	8	9	12	11	5	58
Hypotension	4	3	6	2	5	3	23
Hypertension	8	2	11	4	13	6	44
Pruritus	7	6	4	11	6	8	42
Total '	48	30	44	44	46	36	248

Data are n

Table 5: Risk ratios with 95% confidence intervals of the types of caesarean section and anaesthetic techniques on the development of maternal complications

Risk factors	All complications	Anaesthesia related complications	Immediate postoperative ICU admission	Intra-operative cardiac arrest/ death	Haemorrhage ≥1200ml
Emergency vs Elective	1.2 (1.0-1.5)	0.8 (0.6-1.0)	-	-	1.6 (0.8-3.3)
GA vs RA	5.2 (4.3-6.2)	2.8 (2.2-3.6)	76.8 (23.8-248)	24.9 (5.3-116.9)	13.1 (7.7-22.4)

instance, those who received GA were five times more likely to develop any complication and 13 times more likely to have haemorrhage ≥1,200ml compared with those who received RA.

Discussion

This audit highlighted obstetric anaesthetic practice in a teaching hospital in South Western Nigeria. Our caesarean section rate of 31.1% is higher than 24% reported by Okafor *et al.* [3] in a South Eastern Nigerian teaching hospital and 20% for Korle Bu Teaching Hospital, Ghana [8]. It is however, comparable to the national rates of United States of America and Switzerland (32%) in 2007 [2,9]. However, higher rates have been reported in Italy 39% and Brazil 41.8% [9,10]. Rising CS rate has been described as an epidemic and constitute an economic burden as well as an increased risk of severe feto-maternal morbidity and mortality [10].

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The predominant use of regional blocks (86.2%) for caesarean delivery in our centre aligns us with global standards [11,12]. However, epidural and combined spinal epidural anaesthesia which accounted for 0.2% was not routinely used due to cost and epidural analgesia service for labour pains was only available on request at our centre during the study period. Nafiu and Elegbe, [8] reported the predominant use of GA in Ghana (70.3%) and Lamina [6] in Sagamu, Nigeria (88.4%) but these workers identified a shift from GA to RA towards the end of their study periods in 2005. With obstetric general anaesthesia evidently low in our institution between 2008 and 2010, our findings agree with them.

Our result of 83.8% regional anaesthesia for emergency CS is close to 85% proposed by the Royal College of Anaesthetists in the UK for emergency caesarean deliveries [13]. This is comparable with the percentages in the UK (86.6%) and Singapore (79.5%) and is clearly in keeping with global trends. Regional techniques are considered safer for both mother and foetus [14,15].

In this study, 10.5% of parturients had complications less than 27% reported by Pallasmaa *et al,* [16] in Finland. We report 7.3% attributable to anaesthesia with haemodynamic fluctuations (hypotension, hypertension, bradycardia and tachycardia) accounting for 57% (Table 3). There was more hypotension with GA than RA especially after induction with thiopenthal, which is an indication of poor patient preparation as adequate fluid pre-hydration could have prevented this. There was no statistically significant difference in the incidence of intraoperative cardiac arrest or anaesthesia-related complications among those who had emergency CS and those who had elective CS. Poor recording of events during the conduct of anaesthesia and lack of follow-up of patients after the procedure could be responsible for the small number of complications analyzed in this study. Our finding of 1.0% inadequate spinal anaesthesia necessitating a repeat spinal or conversion to GA is within the range of 0-6% reported by other studies [1,2,11].

This low figure could also be due to underreporting associated with retrospective studies. Our blood transfusion rate of 4.6% is comparable with the range of 3-4% published by other workers, [17,18] but less than 6.4% reported in a Finnish study [16]. Our data revealed that GA was a significant risk factor compared with RA in the four categories of complications. This is consistent with studies that showed that increased maternal risk has been associated with GA [19,20]. However, one limitation the retrospective nature of the design of this study imposed on our findings was that it was difficult to be sure that the anaesthetic technique itself was the cause of complication; at best we can describe an association. For example, parturients who presented with abnormal placentation or ruptured uterus were more likely to have had GA for their surgeries and the haemorrhaging that occurred would not be unexpected. While it has been stated that GA should not be avoided when necessary for caesarean delivery, Wong [20] posited that the risks of GA outweighed its benefits for most elective operative deliveries. This is because airway disaster and pulmonary aspiration from intubation failure remain the major anaesthetic reason for maternal morbidity and mortality during GA.

We could not ascertain the status of the anaesthetists/obstetricians in this survey and as a consequence, a prospective study has been designed to address this as well as other limitations acknowledged.

In conclusion, obstetric general anaesthesia is low in our centre. Our result showed that general anaesthesia was a significant risk factor for maternal complications during caesarean section.

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stigmaterol, ampesterol. Phenolic compounds such as evofolin-A and B, scopoletin vomifoliol, loliolid and 4-ketopinoresinol have also been isolated [13].

A review of literature showed that scanty pharmacological data exist on the effects of the ethanol extract of *Sida acuta* on neurobehavioural activities. Therefore, this study was aimed at further investigating the central nervous system activities of the ethanol extract of this plant to widen the scope of the available literature on the subject as well as providing a positive pharmacological basis for its use as phytomedicine.

Materials and methods

Plant material and preparation of extract

The plant *Sida acuta* was collected locally from gardens at Agbowo, Ibadan, Nigeria. The plant specimen was identified and authenticated at the herbarium of Forestry Research Institute of Nigeria (FRIN), Ibadan, with voucher's No: FHI/06996.

For the preparation of ethanol extract, the method of Abdulrahman *et al* [14] was used. Seven hundred grams of the leaves were dried under shade, the dried material was powdered using a laboratory blender and then extracted with 2 litres of absolute (100%) ethanol for 72 hours in a properly covered and labelled conical flask. The extract was filtered with sterile filter paper and the filtrate concentrated using rotary evaporator at a temperature of 40°C and reduced pressure. The residue obtained was stored at 5°C in a refrigerator until ready for use.

Animals

Male albino Swiss mice (18 – 25 g) were obtained from the breeding colony of the Central Animal House, College of Medicine, University of Ibadan, Nigeria. They were divided into five groups of six (6) animals each and acclimatized for a minimum of five days in plastic cages prior to the pharmacological experiments with free access to standard rodent pellet diet and tap water in an environment with 12/12h light-dark cycle. Animals were handled in accordance with the National Institutes of Health (NIH) Guide for the Care and Use of Laboratory Animals throughout the period of the study.

Drugs and chemicals

Chlorpromazine (BDH, Poole, England), acetic acid (BDH, England), formalin (BDH, Poole, England), apomorphine (Sigma, St Louis, USA), acetylsalicylic acid (Sigma, USA), imipramine (Sigma, St Louis, USA) and indomethacin (Dana pharmaceuticals, Ibadan, Nigeria) were used for the study.

Depression models

Forced Swim Test (FST)

Forced swim test was employed as the behavioural model in screening for the antidepressant property of *Sida acuta* as previously described by Porsolt *et al* [15]. The animals were subjected to a pretest in order to get them adjusted to the experimental conditions. Each animal was placed in a transparent glass cylinder (20cm x 10cm x 10 cm) containing water kept at a temperature of 34 ± 1°C and was made to swim for 15 minutes twenty four hours prior the actual test. The animals were removed from the water and allowed to dry. On the test day, the animals (6 mice per group) were treated with *Sida acuta* (50–200 mg/kg, p.o.), distilled water (10 ml/kg, p.o.) or imipramine (50 mg/kg, i.p.) and 30 minutes after, they were made to swim again in water for a total duration of 6 minutes. During the 6 minute test, duration of immobility was measured in the last 5 minutes. The animals were assumed to be immobile when the animals remained floated passively with their heads above the water making only the movements necessary to keep their heads above the water.

Tail Suspension Test (TST)

The tail suspension test was used as the second behavioural model for assessing the antidepressant effect of *Sida acuta* according to Steru *et al* [16]. Thirty minutes before the test, the animals were pretreated with *Sida acuta* (50–200 mg/kg, p.o.), distilled water (10 ml/kg, p.o.) or imipramine (50 mg/kg, i.p.). After which the mice were individually suspended, from a cord of about 50cm in length stretched between two metal tripods at a height of 70cm, with an adhesive tape placed 1cm away from the tip of the tail. Duration of immobility was recorded during the last five minutes of a total duration of the 6-minute test. Mice were considered immobile only when they hung passively and were completely motionless.

Nociceptive behaviour assessment tests

Formalin-induced paw licking test

The effect of *Sida acuta* on formalin-induced biphasic pain was assessed according to Hunskaar and Hole [17]. Thirty minutes to the test, the animals were pretreated with *Sida acuta* (50–200 mg/kg, p.o.), indomethacin (50 mg/kg, p.o.) or distilled water (10 ml/kg, p.o.). Each mouse received intraplantar injection of 20μl of 1.0% formalin in the right hindpaw. After formalin injection, the time spent licking the injected paw was measured in first (0-5 mins) and second (15-30 mins) phases.