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Anaesthesia related complications following caesarean delivery necessitating Intensive Care Unit admissions in a tertiary centre

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Summary

To determine the anaesthesia-related complications after caesarean section in a tertiary hospital, the hospital records of parturients admitted to the Intensive Care Unit (ICU) after caesarean section were studied. In a ten-year period, 2,686 women were delivered by caesarean section at the University of Benin Teaching Hospital, Benin City. Two thousand one hundred and two (78.3%) had emergency caesarean section while 584 (21.7%) had elective caesarean section. Of these, 2597 (96.7%) had general anaesthesia (GA) and 89 (3.3%) regional anaesthesia (RA). Within this period, 30 parturients (1.1%) were admitted to the ICU; one was after elective caesarean and 29 (96.7%) were after emergency caesarean section. Fifteen patients were admitted for anaesthesia-related complications, of which all were after caesarean section done under GA. The incidence of a major anaesthetic complication resulting in ICU admission was 15 in 2597 GA while it was zero in 89 RA ($p < 0.01$). Total maternal deaths in the ICU admissions were 11 (36.7%); anaesthesia being directly the cause of death in 3 (27.3%) while non-anaesthetic factors accounted for 8 (72.7%) deaths. Emergency caesarean section and GA were risk factors for anaesthesia-related morbidities after caesarean section. Preventable deaths due to poor laboratory support services and inadequate anaesthetic materials accounted for the anaesthesia-related mortalities.

Keywords: *Obstetric, general anaesthesia, subarachnoid block, complications, ICU admission.*

Résumé

Pour déterminer les complications relevant de l'anaesthésie après césarienne dans un hôpital tertiaire, le dossier des malades internes d'un centre de soins intensifs (ICU) après une section césarienne a été étudié. En 10 ans, 2686 femmes ont accouché par césarienne au centre hospitalier universitaire de la ville de Bénin (un Nigérien). 2102 (78,3%) étaient des cas d'urgence alors que 584 (21,7%) ont eu une césarienne élective. De ces-ci, 2597 (96,7%) ont eu une anesthésie générale (AG) et 89 (3,3%) une anesthésie locale (AL). Pendant cette période, 30 parturientes (1,1%) ont été admises à l'ICU, l'une après césarienne élective et 29 (96,7%) après césarienne d'urgence. 15 patients ont été admis pour complications relevant de l'anaesthésie, desquels tous étaient après césarienne faite sous AG. L'incidence d'une complication majeure résultant de l'anesthésie chez les malades admis à l'ICU était de 11 (36,7%), l'anesthésie étant la cause directe de 3 cas de décès (27,3%) alors que les facteurs n'ayant pas trait à l'anesthésie ont causé la mort chez 8 patients (72,2%). La césarienne d'urgence et l'AG étaient les facteurs de risque pour la morbidité anesthésique après césarienne. La prévention des décès due au mauvais support des services de laboratoire et les matériels anesthésiques inadéquats étaient la cause principale de mortalité liée à l'anesthésie.

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Introduction

Surgical delivery is a major component of modern obstetric care [1]. This invariably implies the need for anaesthetic services. Consequently, some parturients suffer some anaesthetic complications which may make them require further management in the Intensive Care Unit (ICU). The additional and exorbitant cost of ICU management may be obviated if the risk factors for such admissions are identified and addressed. Similarly, the evaluation of the place of anaesthetic services in Maternal and Child Health will enable hospital administrators and managers to channel funding and support to obstetric anaesthesia for a better postoperative outcome. However, there is limited data on the role of anaesthesia in maternal morbidity and mortality in developing countries where anaesthesia services may not be optimal. This study thus reviewed the pattern of anaesthesia-related complications requiring further management in the ICU.

Methods

The hospital records of patients admitted to the ICU of the University of Benin Teaching Hospital, Benin City between 1st January 1986 and 31st December 1995 were studied. Those who were admitted after caesarean section for anaesthesia-related complications were identified and subjected to further scrutiny. A standardized questionnaire was drawn to obtain information on the indication(s) for and the type of caesarean section, i.e., elective or emergency; anaesthetic technique, cadre of attending anaesthetist, indication for ICU admission, management and outcome.

Admission criteria to the ICU in our hospital include the need for respiratory support or intensive therapy. The decision for admission to the ICU was often taken by the senior registrar/consultant in the ICU.

Result:

In the ten-year period, 2,686 parturients were delivered by caesarean section. Ninety six point seven percent; 96.7% ($n = 2597$) had GA and 3.3% ($n = 89$) had RA (Table 1). Emergency caesarean sections were 2102 (78.3%) while 584 (21.7%) were done electively. Anaesthesia-related complica

Table 1: Technique of anaesthesia

Anaesthetic	No. of Caesarean Section	%
General anaesthesia (GA)	2597	96.7
Regional anaesthesia (RA)		
SAB	70	2.6
EB	19	0.7

SAB = Subarachnoid block
EB = Epidural block

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tions, hypertensive disease of pregnancy and haemorrhage were the leading causes of ICU admission after caesarean section (Table 2). Table 3 shows the anaesthesia-related complications. Table 4 shows that 30 patients (1.1%) were admitted to the ICU: one after elective caesarean section and

Table 2: Causes of obstetric admission to the ICU after caesarean section

Causes	Number	%
Hypertensive disease of pregnancy	8	26.7
Haemorrhage	3	10.0
Anaesthesia-related complication	15	50.0
Obesity hypoventilation syndrome	1	3.3
Heart disease	1	3.3
Others	2	6.7
	30	100.0

Table 3: Reasons for admission into the ICU for anaesthesia-related complications.

Patient #	Problem	No. (%)
1	Stridor following extubation	1 (6.7)
2-5	Suspected aspiration	4 (26.7)
6-13	Delayed recovery from GA	8 (53.3)
14-15	Cardiac arrest in the perioperative period	2 (13.3)
		15 (100.0)

Table 4: Type of caesarean section and complication rate

Type of Caesarean section	No. of complication	No. of Anaesthetics	Rate per 10,000
Emergency	29	2102	138.0
Elective	1	584	17.1
	30	2686	155.1

$P < 0.05$

29 (96.7%) after emergency caesarean section. Fifteen patients were admitted for anaesthesia-related complications. They all had general anaesthesia for the operation. The unadjusted odds ratio for admission to ICU was eight times greater after emergency caesarean section when compared with elective caesarean section. The incidence of major complication resulting in ICU admission was 15 in 2597 GA and none in 89 RA (Table 5). Total maternal deaths of ICU obstetric admissions were 11 (36.7%). Anaesthesia was directly the cause of

Table 5: Relative safety of GA and RA

Anaesthetic	Complications	No. of Anaesthetics	Rate per 10,000
GA	15	259	57.8
RA	0	89	0
Total	15	2686	57.8

death in 3 (27.3%) while non-anaesthetic factors accounted for 8 (72.7%) deaths. Aspiration pneumonitis, electrolyte disturbances and difficult airway were respectively the cause of the 3 deaths.

Brief histories of the 15 patients who had complicated GA are presented below:

Respiratory stridor

Patient #1 had emergency caesarean section at 34 weeks of gestation for severe preeclampsia. The course of surgery and anaesthesia was seemingly uneventful. She developed stridor on extubation due to laryngeal oedema. Her trachea was immediately reintubated. She remained stable after reintubation and removal of endotracheal tube 48 hours later.

Suspected aspiration

Patients #2-5 were admitted to the ICU on suspicion of pulmonary aspiration of gastric contents. Observed risk factors included intraoperative vomiting and spontaneous deflation of tracheal tube cuff, crepitations on chest auscultation, unexplained tachypnoea and tachycardia. The patients were ventilated for variable periods ranging from 20 to 48 hours. One of the patients died. She was noticed to have regurgitated gastric contents few minutes after induction. The efficacy of the tracheal tube was lost on quick examination. Her oropharynx was quickly suctioned. Trachea toileting was done through the endotracheal tube. Hydrocortisone 100mg was given intravenously. The anaesthesia and surgery were concluded without further untoward events. The attending anaesthetist (a senior house officer) extubated the trachea of the patient at the conclusion of surgery. On further evaluation 8 hours postoperatively, the patient's trachea was re-intubated and commenced on mechanical ventilatory support by a senior registrar. She died 24 hours later in the ICU.

Delayed recovery from GA

Patients #6-13 showed delayed recovery from GA. They were ventilated in the ICU for periods ranging from 6 to 30 hours. Seven of the patients recovered and were discharged to the lying in ward. One of the patients died after about 10 hours in the ICU. The report of preoperative electrolyte estimation received 6 hours postoperatively, revealed hypokalaemia of 2.2 mMol/L. Attempts at correction was yet to be completed when the patient died. The causes of delayed recovery were not ascertained in the other patients. It is our practice to allow recovery from the effects of depolarizing neuromuscular blockers before the administration of non-depolarising muscle relaxant. This removes the suspicion of atypical pseudocholinesterase. Other possible causes of delayed recovery from GA that were considered include residual effects of anaesthetics, narcotic analgesics and neuromuscular blockers, metabolic disorders, pre-existing altered consciousness and central nervous disorders (cerebrovascular accident).

Cardiac arrest in the perioperative period

Patients #14 and 15 suffered cardiac arrest in the perioperative period. Patient #14 had severe pre-eclampsia and was scheduled for emergency caesarean section under general anaesthesia. She suffered cardiac arrest at induction of general anaesthesia. She was successfully resuscitated. No reason was immediately found for the cardiac arrest but heavy sedation with diazepam, bolus hydralazine and subsequent normal doses of the induction agents she had may have been responsible. She was managed successfully in the ICU. Patient #15 had severe pre-eclampsia. The attending anaesthetists encountered difficulty with endotracheal intubation. On successful tracheal intubation, she had cardiac arrest from which she was successfully resuscitated. The surgery was concluded

without further incidents. She had delayed recovery from anaesthesia and mechanical ventilation of her lungs was carried out in the ICU for 24 hours before death. All the anaesthetics were delivered by registrars in the second or third year of training.

Discussion

The results indicate the place of anaesthesia in maternal morbidity after caesarean section. Emergency caesarean section is a major risk factor for admission to ICU when compared to elective caesarean section. The anaesthesia related mortality were due to preventable factors such as inadequate anaesthetic materials and poor laboratory backup. Lapinsky *et al.* [2] reviewed a series of critically ill obstetric patients admitted to the general ICU in a Canadian centre. Admission to the ICU was necessitated by obstetric complications predominantly preeclampsia and a variety of medical conditions. There were no anaesthesia-related complications and no maternal mortality was recorded.

Aspiration of gastric contents was responsible for 25% of anaesthesia-related complications. Aspiration of gastric contents remains a recurrent factor in anaesthesia-related maternal morbidity and mortality [3,4] in spite of continuous emphasis on prophylactic measure [5]. Although, the mortality rate following aspiration of gastric contents has been reported to be between 4.6 and 5% [6,7], this was not so in this study. The mortality rate of 25% as seen in this group of patients may not be surprising as the final outcome depends on the co-morbidity disease, the material aspirated, early recognition and the therapy instituted. Prophylaxis against acid aspiration in our hospital and elsewhere in Nigeria is the administration of antacids and application of cricoid pressure at the induction of GA. The usefulness of magnesium trisilicate, the mainstay of acid aspiration prophylaxis in Nigeria has been challenged [4,5]. Non-particulate sodium citrate and H₂-blockers are now preferred for such prophylaxis. The sudden loss of the endotracheal tube integrity intraoperatively due to old age and overuse is rather peculiar to the developing countries where budgetary allocation to health is poor. Such occurrence will result in aspiration particularly when vomiting or regurgitation occurs. It may be prudent therefore, to prophylactically pack around the endotracheal tube whenever such an old, worn out tube is in use. In the alternative, patients may be asked to procure new endotracheal tube. This will improve safety but also escalate the cost of anaesthetic care.

Cardiac arrest sequel to difficulty with tracheal intubation as seen in this study, must be prevented. Difficulty with tracheal intubation is a major factor in anaesthesia-related maternal complications. The incidence of difficult intubation in our obstetric patients is not known but failure to intubate or difficulty with airway management is considered to be much greater in the obstetric patients than in the non-obstetric patients [8,11]. Adequate measures must be taken therefore to forestall this danger. If difficulty with tracheal intubation does occur, repeated attempts at laryngoscopy and tracheal intubation must be discouraged. Persistent attempts are fraught with the dangers of hypoxia, gastric acid aspiration and trauma; which are potentially fatal. About 40% of maternal deaths directly attributable to anaesthesia are from hypoxia, of which aspiration of gastric contents and difficult intubation are the major causes [4,12]. When difficult airway management is encountered, emphasis should be on justifiable attempts, early institution of failed intubation drill and

improved monitoring. The place of laryngeal mask airway in such an emergent situation is contentious as it does not protect against aspiration but allows safer oxygenation [13].

The incidence of death attributable entirely to anaesthesia in this study is 1.1/1000. The avoidance of associated factors like difficult airway management, aspiration pneumonia, improved support services and close supervision of trainee anaesthetists will result in a better outcome. In the developed countries, there has been a decline in anaesthesia-related maternal deaths [14, 15]. Direct deaths from anaesthesia in the United Kingdom has reduced from 6 of 223 deaths in 1985-87 to 1 of 268 deaths in 1994-96 [14-15]. Increased awareness of risks of obstetric anaesthesia, increasing use of regional anaesthesia for caesarean section and increasing anaesthetic resources devoted for obstetric services [16] have been cited as reasons for the decline. General anaesthesia is the predominant technique for caesarean section in our hospital, hence the relative safety of regional technique over general anaesthesia though demonstrated and emphasized elsewhere, [17] was lacking in our results.

Caesarean section as a method of delivery carries certain risks. It has been suggested that the relative risk of maternal death is from 2 to 11 times greater with a caesarean section than with vaginal birth [18]. The risk associated with caesarean section is further accentuated by the rather high incidence of emergency caesarean section in our centre often indicated by haemorrhage, obstructed labour and eclampsia which are associated with high morbidity and mortality. Emergency caesarean section, though a safe method of delivery in patients who received antenatal care in hospital [19], the morbidity and mortality is worse when compared to elective operation [19, 20]. Emergency caesarean section is accompanied by all the added risks of rapid induction of general anaesthesia with full stomach, increased difficulty with airway management, and the provision of anaesthesia at periods when the best of hands may not be available. Interaction with the anaesthetist by the obstetrician should be early, and not only when set for the operating room. Early consultation facilitates a well co-coordinated complementary management strategy for a better outcome.

Laryngeal oedema, though rare, is a potentially serious complication of preeclampsia. It may be of the general oedema and facial swelling often seen in these patients. Thus, anticipation of a likely airway obstruction as seen in patient #1 may be rewarding, although laryngeal oedema may develop in the intraoperative period [21], Potgieter and Hammond [22], had suggested a cautious method of identifying these patients who may develop airway problems on extubation: when the cuff is deflated, air passing through tracheal tube is assessed by occluding the endotracheal tube lumen and allowing the patient to breath around the tube. This is only possible if there is no laryngeal oedema. On the contrary, extubation should be delayed until the oedema resolves.

Anaesthesia-related morbidity and mortality are often avoidable. Improved health financing and laboratory services are necessary for safe motherhood and maternal care. Anaesthesia for the obstetric patient is necessary but could be hazardous. Only adequately trained anaesthetists with sufficient exposure in obstetric anaesthesia should provide anaesthesia for caesarean section. An increased use of regional anaesthesia for caesarean section may reduce the anaesthesia related morbidity and mortality.

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