

## Review of Early Anaesthetic Complications in a Tertiary Health Care Centre in South Eastern Nigeria

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### ABSTRACT

**Background:** Over the years, anaesthetic practice has evolved, with attention paid to safety guidelines and quality assurance. This has resulted in reductions in anaesthesia-related complications. **Objectives:** This retrospective study examines surgical procedures and anaesthetic complications recorded in a tertiary hospital. **Methodology:** Anaesthetic records of all patients who had surgery during the study period were retrieved. The number of cases done by each surgical specialty, the anaesthetic techniques, and the anaesthetic complications encountered during anaesthesia and before discharge from the recovery room were recorded. Preoperatively, all patients were categorised according to the American Society of Anaesthesiologists (ASA) physical status classification. Cases were grouped according to surgical specialties. Data was analyzed with Statistical Package for the Social Sciences (SPSS) version 25. **Results:** Over a 2-year period, 1784 surgeries were conducted, General and Cardiothoracic surgeries accounted for the highest 354 (19.80%) and lowest 6 (0.30%) cases, respectively. The most common anaesthetic techniques employed were general anaesthesia with endotracheal intubation 731 (43.00%), subarachnoid block 559 (32.90%), and general anaesthesia with facemask 190 (11.20%). Seventy five (4.20%) cases had complications, 19 (1.07%) had hypotension, 15 (0.84%) had delayed recovery from anaesthesia, 9 (0.50%) cases had cardiac arrests and 5(0.28%) had laryngeal. Death on the table occurred in 5 cases (0.28%), bronchospasm, local anaesthetic (LA) toxicity and also nausea and vomiting occurred in 3 cases (0.17%) respectively. Coughing and vomiting, hypoxia and post spinal shivering occurred in 2 cases (0.11%), while total spinal, apnoea, failed intubation, bradycardia, pulmonary oedema, extrapyramidal side effects of metoclopramide and shock occurred in 1 patient (0.06%) each. **Conclusion:** Hypotension, delayed recovery and cardiac arrest were the most common complications in our environment. There was no association between the ASA physical status and the occurrence of anaesthetic complications.

**Keywords:** Anaesthesia; Complications; Records; Specialties; Surgery.

### OPEN ACCESS

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## INTRODUCTION

Surgery and anaesthesia pose risks to patients. In recent years, introduction of safety standards, advanced surgical procedures, appropriate anaesthetic management and improvements in the training of anaesthetists have reduced the occurrence of serious harm during anaesthesia.<sup>1,2</sup> Complications arising from the administration of anaesthesia may occur early during anaesthesia and while patients are in the recovery room, or later on the wards following discharge from the recovery room.

The World Health Organisation (WHO) estimates that 234.2 million major surgical and anaesthetic procedures are conducted per annum under anaesthesia, with a crude mortality rate of 0.5-5%, and complications occurring in up to 25% of patients.<sup>3,4</sup> Safe anaesthesia is consequently imperative. The WHO "Safe Surgery Saves Lives" global patient safety challenge has improved surgical safety by initiating the WHO Surgical Safety Checklist.<sup>3</sup>

In high income countries, anaesthesia-related mortality in patients who do not have systemic illness has declined from 6.4/10,000 in the 1940s, to 0.4/100,000 as of 2011.<sup>2</sup> Mortality has been shown to be higher with severe co-morbidities.<sup>2</sup> Figures from low- and middle income countries however differ. Anaesthesia related mortality rate of 41 per 1000 has been reported in Democratic Republic of Congo, and a perioperative mortality rate of 10.7% Southeast Nigeria.<sup>5,6</sup> There is paucity of data on the incidence of anaesthetic complications as a whole in our environment; most works tend to report data on individual anaesthetic techniques. It is important to document and review information regarding anaesthetic complications in order to put measures in place to reduce their occurrence.<sup>7</sup> Poor documentation and recording of preoperative anaesthetic records can be an impediment to improving patient outcomes following surgery.<sup>8</sup> This study therefore aims to ascertain the incidence, types and frequency of occurrence of early anaesthetic complications among patients who had

surgery at Nnamdi Azikiwe University Teaching Hospital and to evaluate the association of ASA physical status and other factors associated with the occurrence of these complications.

## METHODOLOGY

This is a retrospective study conducted at the main theatre and obstetric theatre complexes of the Nnamdi Azikiwe University Teaching Hospital Nnewi, a tertiary health care facility in Anambra State, South-East Nigeria, from August 2019 to July 2021. The hospital is a referral centre in South-East Nigeria, providing health care for urban and rural populations of low, middle, and high socioeconomic populations. The study population comprised all patients who had elective and emergency surgical procedures at the study site within the study period. Data obtained was from patients aged one day to 89 years. Patients with incomplete anaesthetic records were excluded. Data was collected from anaesthetic records of 1,784 surgical cases and includes demographic, epidemiologic data, ASA physical status, surgical specialty, anaesthetic techniques, and complications. Data was analyzed with the IBM Statistical Product and Service Solutions (IBM SPSS statistics) version 25.

The results were summarized and expressed as means, standard deviations, frequencies, and percentages. The Chi-square test was used to test for associations between categorical variables. The p-value of less than 0.05 was considered statistically significant.

## RESULTS

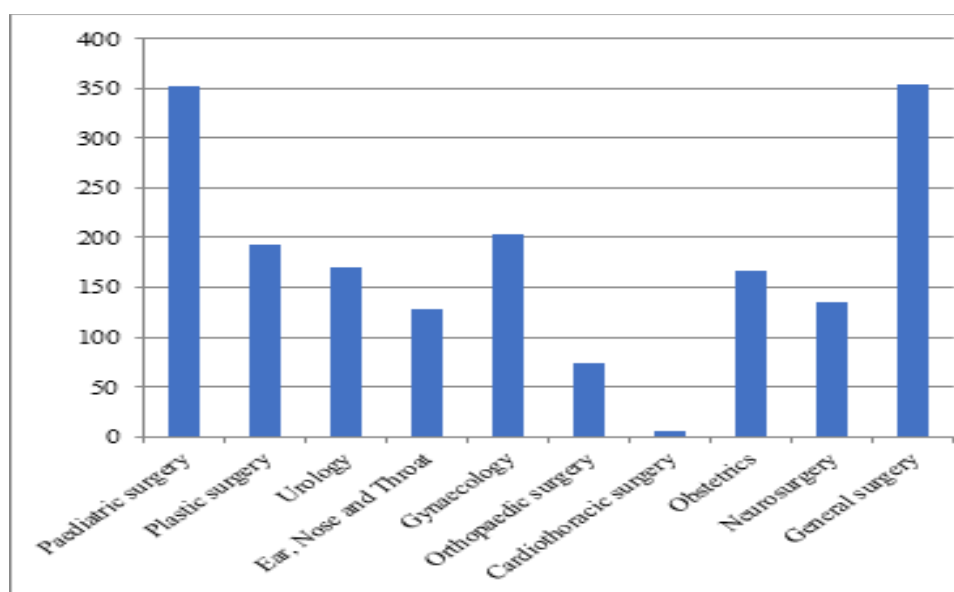
A total of 1784 patients had surgery during the study period, among whom 893 were males and 891 were females. The mean age was 29.14± 25.51 years, while the age range was one day to 89 years. General surgery, paediatric surgery and gynaecology had the highest number of cases at 354 (19.8%), 352 (19.7%), and 203 (11.4%) respectively, while cardiothoracic surgery had the least number of cases (6 patients [0.3%]) (figure 1). Seven hundred and thirty-one (43.0%) had general

anaesthesia and endotracheal intubation (GA/ETT), 559 (32.9%) had a subarachnoid block (SAB), and 190 (11.2%) had general anaesthesia with a facemask (GA/FM). General anaesthesia and endotracheal intubation was the most commonly used technique in cardiothoracic surgery (5 [100%]), otorhinolaryngology (ENT) (87 [82.1%]), neurosurgery (102 [69.4%]), general surgery (223 [63.0%]). On the other hand, SAB was mostly used in orthopaedics (59 [83.1%]), obstetrics (133 [82.1%]), and urology (109 [78.4%]). In paediatric surgery, GA/FM (168 [48.0%]) and GA/ETT (127 [36.2%]) were the commonly used anaesthetic techniques, whereas, in plastic surgery, SAB (67 [34.0%]) and GA/ETT (62 [31.5%]) were mainly used. In gynaecology, SAB (81 [40.9%]) and GA/ETT (71

[35.9%]) were the most commonly used anaesthetic techniques (table 1).

The incidence of complications among the studied population was 4.20% (75 patients). The most common complication was hypotension 19(1.07%), delayed recovery 15(0.84%) and cardiac arrest 9(0.50%).

Hypotension occurred mostly among patients of ASA class 2 and 3, delayed recovery occurred mostly in patients of ASA class 3 and 3 E, while cardiac arrest was seen mostly in ASA 2 and 3E (table 2) (p=0.418)



**Table 1: Distribution of Patients Across Specialties with different Anaesthetic techniques**

Specialty	Anaesthetic techniques (%)											
	GA/ETT	SAB	GA/Jet	Epi	LA/ sed	GA/fm	MAC	CSE	Sed	GA/LMA	GA/Tra	GA/Nas
CTS	5(100)	0	0	0	0	0	0	0	0	0	0	0
ENT	87(82.1)	0	9(8.5)	0	2(1.9)	5(4.7)	0	0	0	0	3(2.8)	0
GS	223(63.0)	85(24)	0	1(0.3)	31(8.8)	3(0.8)	2(0.6)	2(0.6)	7(2)	0	0	0
GyN	71(35.9)	81(40.9)	0	0	0	3(1.5)	0	34(17.2)	8(4.0)	1(0.5)	0	0
NS	102(69.4)	0	0	0	30(20.4)	0	3(2.0)	0	12(8.2)	0	0	0
ObS	26(16.0)	133(82.1)	0	0	0	1(0.6)	0	1(0.6)	1(0.6)	0	0	0
OT	9(12.7)	59(83.1)	0	0	0	0	0	1(1.4)	0	0	0	0
PdS	127(36.2)	25(7.1)	0	0	0	168(48.0)	0	0	20(5.7)	0	0	0
PS	62(31.5)	67(34.0)	0	0	35(17.8)	10(5.1)	4(2.0)	0	6(3.0)	2(1.0)	1(0.5)	10(5.1)
Ur	19(13.7)	109(78.4)	0	0	0	0	0	11(7.9)	0	0	0	0

\*Ankle block: 1 in OT, 3 in 1 block: 1 in OT, Caudal block: 10 in PdS

**Legend:**

**CTS:** Cardiothoracic surgery **ENT:** Otolaryngology **GS:** General Surgery **GyN:** Gynaecology. **NS:** Neurosurgery **Obs:** Obstetrics **OT:** Orthopaedic **PdS:** Paediatrics **PS:** Plastic **Ur:** Urology **Epi:** Epidural anaesthesia **SAB:** Spinal anaesthesia **LA/sed:** Local anaesthesia with sedation **MAC:** monitored anaesthesia care **GA/ETT:** General anaesthesia with endotracheal intubation **Sed:** Sedation **GA/Jet:** General anaesthesia with jet ventilation **GA/fm:** General anaesthesia with facemask **CSE:** Combined spinal-epidural anaesthesia **GA/Trac:** General anaesthesia with tracheostomy **GA/LMA:** General anaesthesia with Laryngeal mask airway

**Table 2: Frequency of anaesthetic complications across ASA classes**

Complication	ASA Classification n (%)										X <sup>2</sup>	p-value
	ASA 1	ASA 1E	ASA 2	ASA 2E	ASA 3	ASA 3E	ASA 4	ASA 4E	ASA 5	ASA 5E		
Hypotension	1(5.3)	1(5.3)	7(36.8)	0	5(26.3)	2(10.5)	1(5.3)	2(10.5)	0	0	89.617	0.418
Delayed recovery	1 (6.7)	0	1 (6.7)	2(13.3)	5(33.3)	3 (20.0)	0	2(13.3)	0	1(6.7)		
Cardiac arrest	1 (11.1)	0	3(33.3)	0	1 (11.1)	3 (33.3)	0	1 (11.1)	0	0		
Laryngeal spasm	0	0	4 (80.0)	0	1 (20.0)	0	0	0	0	0		
DOT	0	0	1(20.0)	0	0	3(60.0)	1(20.0)	0	0	0		
Bronchospasm	0	0	1(33.3)	0	(33.3)	0	1(33.3)	0	0	0		
LA toxicity	0	0	0	0	1(33.3)	1(33.3)	0	0	0	1(33.3)		
Nausea and vomiting	0	0	1(33.3)	0	1(33.3)	0	0	1 (33.3)	0	0		
Hypoxia	0	0	0	0	0	1(50.0)	0	1 (50.0)	0	0		
Coughing and vomiting	0	0	0	0	1(50.0)	0	0	1 (50.0)	0	0		
Post spinal shivering	0	0	0	0	0	1(50.0)	0	1 (50.0)	0	0		
Total spinal	0	0	1 (100)	0	0	0	0	0	0	0		
Intermittent apnea	0	0	0	0	0	0	0	1 (100)	0	0		
Failed intubation	0	0	0	0	0	1 (100)	0	0	0	0		
Bradycardia	0	0	0	0	0	1 (100)	0	0	0	0		
Pulmonary edema	0	0	0	0	0	1 (100)	0	0	0	0		
Extra pyramidal effect of metoclopramide	0	0	0	0	0	0	0	0	1(100)	0		
Shock	0	0	0	0	0	0	0	0	0	1 (100)		

**DISCUSSION**

The rate of anaesthesia related complications vary in different parts of the world. The WHO estimates that the perioperative complication rate in developed countries is 3 to 16%.<sup>2</sup> In our study, a rate of early anaesthetic complications of 4.20% was observed. This falls within the range given by the WHO. Our finding is also similar to what has been reported by Faraj et al where 4.25% of 1128 patients had anaesthetic complications.<sup>9</sup> Like the report by Faraj et al, where most cases were anaesthetised by senior anaesthetists, in our facility, at least a consultant or a senior registrar in anaesthesia must be present during each surgical procedure. Improvements in training of anaesthesia manpower in our centre during the study period may be a factor affecting the rate of complications. Duncan and Cohen also found that the experience of the anaesthetist is a factor affecting the occurrence of complications.<sup>10</sup>

Other researchers have reported figures higher than ours. An overall complication rate of 15.7% revealed by Haugen et al, who reported a significant reduction

in complication rates from 19.9% in the controls to 11.5% due to the implementation of the WHO surgical safety checklist.<sup>11</sup> The checklist has been found to be an efficient proactive modality in increasing patient safety, decreasing the occurrence of errors and adverse effects and significantly reducing morbidity and mortality during the perioperative period.<sup>12</sup> In contrast to Haugen et al, our center did not fully implement the WHO surgical checklist due to delays related to administrative protocols. Schiff et al reported an overall incidence of complications to be 16.2% with rates of 26.2 per million.<sup>4</sup> While they had a very large study population of 1.37 million patients and retrieved data from a national surveillance system based on a core data set from a database, ours is a smaller study with data from a single tertiary hospital.

Proper preanaesthetic evaluation and optimization of patients before surgery are proactive. They aid in preventing and reducing complications, morbidity, and mortality during the perioperative period. Adequate monitoring of the cardiovascular system ensures the detection of arrhythmias and other conditions that may

lead to cardiac arrests. In our study, cardiac arrest occurred in 9 patients (0.50%) who either had postpartum hemorrhage, gunshot to the abdomen or blunt abdominal trauma. This figure is high compared to figures reported by Schiff et al showing a rate of cardiac arrest of 98.6 per million anaesthesia cases.<sup>4</sup> In our study, the severity of cardiovascular and hemodynamic compromise at the time of presentation, late presentation and non availability of appropriate blood and blood products for resuscitation may be contributory to the occurrence of cardiac arrest. Training and retraining of theatre personnel on safety and resuscitative measures including the use of defibrillators will reduce perioperative cardiovascular incidents and improve outcome.

Anaesthetic techniques may influence the types of complications that can occur. In our study, most of the patients with hypotension received subarachnoid block which has hypotension as a prominent side effect, while those with delayed recovery all had general anaesthesia with endotracheal intubation. In our study, hypotension occurred mostly in obstetric patients, possibly because most of them received subarachnoid block and also, pregnant women are prone to the cardiovascular effects of subarachnoid block. This is similar to a report by Jebbin et al where hypotension was among the commonest complications recorded following subarachnoid block.<sup>13</sup> Duncan and Cohen also reported that the type of anaesthetic technique was a risk factor for the development of complications.<sup>10</sup>

There was no significant association between ASA physical status and the occurrence of anaesthetic complications ( $X^2 = 89.617$ ;  $p = 0.418$ ) (table 2). The highest number of complications occurred among ASA 2 (19 patients), ASA 3 (16 patients) and ASA 3E (17 patients) (table 2). This is in contrast with another report in which ASA status and urgency of surgery were factors determining complications, with most complications occurring among ASA 1 and 2 patients.<sup>9</sup> Schiff et al like our study, found that ASA

physical status did not significantly affect the occurrence of complications, their study, however included only ASA 1 and 2 patients who had elective surgery.<sup>4</sup> On the contrary, Duncan and Cohen found the ASA physical status to be a risk factor for postoperative complications and reported that ASA 1E and 2E patients had significantly increased morbidity in the wake of intraoperative problems.<sup>10</sup> In our study, ASA 1E and 2E patients constituted a low percentage of those with complications. Even though Duncan and Cohen conducted their study in a tertiary hospital, the difference in outcome may be because theirs spanned a longer period of 9 years and had a larger study population of 112,721 patients.<sup>10</sup> In contrast to our findings, Ogbuanya et al reported that high ASA status is a risk factor for perioperative mortality.<sup>6</sup> However, unlike our study, which covered the period from induction of anaesthesia to discharge from the recovery room, the study by Ogbuanya et al covered a longer period of observation (72 hours).<sup>6</sup> A different scenario is seen where Koka et al found a low morbidity and mortality rate of 5% among ASA 3 and 4 patients in Sierra Leone.<sup>14</sup> This figure is low compared to the 56.5% in an American-based study.<sup>10,15</sup> Koka et al suggested that ASA 3 and 4 patients with significant comorbidities are possibly deterred from presenting at referral hospitals or may not be considered for surgical treatment in low-resource environments.<sup>14</sup> In our environment, patients with significant comorbidities are very likely to be referred to a tertiary hospital. This may influence the outcome, as the complexity of cases and comorbid conditions may worsen it.

## CONCLUSION

The incidence of early anaesthetic complications was 4.20%. The most common complications were hypotension, delayed recovery and cardiac arrest. The ASA physical status was not associated with the occurrence of anaesthetic complications.

There is need for further studies on other risk factors for the occurrence of anaesthetic complications and outcomes such as anaesthetists' work experience, the influence of the use of the WHO surgical safety checklist and the availability of defibrillators in

operating suites.

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