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Research Article

Anesthesia by Nurse's for Emergent Caesarean in a Level 2 Hospital Facility in Burkina Faso

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Abstract

Background: Caesarean section (CS) is a life-saving surgery. Anesthesia is an integral part of emergency obstetric care. This study aims to analyze anesthesia practices by nurses for emergency CS (ECS) in a regional hospital of Burkina Faso.

Methods: A prospective study was carried out over 3 months among women undergoing ECS.

Results: 222 women were in needs of CS whose 198 were emergent. The average age was 25.4 ± 6.3 years. 78.4% of them were referred from other facilities. Red code was observed in 61.9%. Indications were fetal-related in 40.9% and maternal-related in 32.4%. Most of patients were ASA 2 (79%). Majority (86.6%) received spinal anesthesia (SA). Rapid sequence induction (RSI) was not practiced. The average Apgar score was 7.7 ± 2.3 (p = 0.0004) at one minute and under SA against 5.7 ± 3.6 under GA. The mean time from decision to anesthesia was 66.1 minutes and the mean time form decision to delivery was 72.6 min. Post-operative pain was less frequent after SA than GA 13.33%. Six neonatal deaths were observed but no maternal death was reported.

Conclusion: There is a delayed to perform ECS in the regional hospital of Ouahigouya.

Keywords: *Anesthesia; Cesarean Section; Emergency; Regional Hospital*

Abbreviations

CS: Caesarean Section; ECS: Emergency Caesarean section; ASA: American Society of Anesthesiologist; SA: Spinal Anesthesia; GA: General Anesthesia; RHO: Regional Hospital of Ouahigouya; DDI: Decision to Delivery Interval; VAS: Visual Analogic Scale; FSA: Failed Spinal Anesthesia; DVTE: Deep Venous Thromboembolism; RSI: Rapid Sequence Induction

Introduction

Cesarean section (CS) may be a life-saving surgery when complications arise during pregnancy or labor. According to recent data, the average global rate of CS is 18.6%, ranging from 6.0% to 27.2% in the least and more developed regions, respectively [1]. The frequency of childbirth by CS is increasing [2] worldwide.

Anesthesia cares are integral part of emergency obstetric care but in developing countries, particularly in sub-Saharan Africa, there is a paucity of anesthetic doctors, a lack of infrastructure, drugs and equipment [3]. ECS is defined by the need to carry out CS in order

to reduce risk to life of mother and fetus. Some times quoted are suggested in guidelines but current medical evidence does not confer improved outcome with strict adherence to the time frame. General Anesthesia (GA) is the fastest method for anesthetizing but it is associated with increased maternal morbidity and mortality [4]. The majority of population in developing world does not have access to safe anesthesia services [5]. Trained anesthesiologists prefer to work in urban area, thus making human resources even more unevenly distributed [6]. There is often a lack of adequate equipment to provide GA. Pregnant patients often present with difficult airway conditions with even greater risks. Then SA is an alternative to GA.

Delay in care is a major risk factor of maternal and fetal death. Burkina Faso is an under-developed country where there are many issues in anesthesia practice in rural area related to anesthesia workforce limitation, medication availability, poor equipment, lack of skills and technical resources. Our study aims to describe anesthetic management by nurses for ECS in a level 2 hospital facility in Burkina Faso.

Methods

The hospital structures regarding anesthesia service encompassed of 6 teaching hospital, 9 regional hospitals, 45 District hospital. 45 Physicians anesthetist whose 43 work in the main town of the country (Ouagadougou and Bobo Dioulasso), 3 in regional hospital and 2 in private. Nurses anesthetists are 650 whose 48,5% work in the main town of the country. Most of anesthesia in regional and district hospital are provided by nurses.

This was a hospital-based cohort study conducted between 1st April and 30th June 2016 Women with need of emergency delivery by Cesarean were included Decision to delivery interval (DDI), maternal and perinatal outcomes were analyzed. The RHO is the referral hospital of North region of Burkina Faso. Ouahigouya is at about 181 km from Ouagadougou. The obstetric unit has a labor ward, one operating room and a newborn unit. The labor ward has 8 beds, a 5 beds post-delivery room and two delivery rooms. Midwives work in 5 teams, each one including two midwives. There is an obstetrician on call 24 hours a day. There is no anesthetist physician. Anesthesia is performed by nurse anesthetists who are not dedicated to the obstetric unit only. On call, only two nurse anesthetists are present in the hospital to cover both other types of surgery and obstetric emergencies.

Pregnant women, having reached at least 28 weeks of amenorrhea, with ECS indication and who had given consent to participate were included. Patients with uterine rupture diagnosed pre-operatively were excluded. A red code ECS is defined by a DDI of less than 15 minutes; orange code between 15 and 30 minutes DDI and green code by DDI between 30 to 60 minutes [7].

Participants were interviewed by the investigator in labor room using a structured questionnaire. Sociodemographic data, indication for ECS, time of decision to CS, time of arrival in the operating room, anesthetic agent, skin incision and delivery times were collected. Women were followed up post-operatively during 48 hours. Similarly, all newborns admitted into the newborn units were followed up. Maternal and neonatal outcomes were analyzed. Data were analyzed using Epidemiologic Information version 7.1.5 software. Chi square test was used to measure associations. Statistical significance was defined for p value less than 0.05.

Approval was obtained from the Regional Hospital of Ouahigouya (RHO) Research Committee. Participation was voluntary and informed consent was sought before enrolment. Consent to participation was requested. Names and other participant information were omitted from the questionnaires and instead a study number unique was allocated for purposes of identification, analysis and presentation to ensure confidentiality of information. There were no benefits offered to participants.

Results

A total of 222 CS were recorded of which 139 were (77.7%) emergent and 105 out of those 139 cases were included in this study. Patients' average age was 25.4 ± 6.3 years. Women were mainly housewives (88.6%), living outside Ouahigouya town (72.4%), and were referred from other facilities. Table 1 shows socio-demographic and admission features. Thirty-four cases were excluded due to investigator participation to care.

Characteristics		Mean	Frequency	Percentage
Age (years)		25.4 ± 6.3		
	[15 - 19]		24	22.8
	[20 - 24]		25	23.8
	[25 - 29]		26	24.7
	[30 - 34]		18	17.2
	[35 - 39]		12	11.4
Profession	Housewife		93	88.6
	Self-Employed		3	2.8
	Professional		8	7.6
	Student		1	0.9
Residency	Inside town[a]		29	27.6
	Outside town		76	72.4
Referral status	Referred		76	72.4
	Not referred		29	27.6

Table 1: *Socio-demographic and admission data (n = 105).*

[a]: Ouahigouya.

History of past pregnancies was reported in 87 cases. Mean parity was 3 ± 2 and 33.2% patients were primiparous. Most women didn't have antenatal care. Most red code ECS (61.9%) were related to fetal urgency. ECS indications were mainly fetal distress (50.5%) and impending uterine rupture (17.2%). Surgery was performed by a team encompassing nurse surgeons and general practitioner in 77.2%, by an obstetrician in 22.8% with nurse surgeons. Table 2 shows the indications for ECS.

Indications	Spinal Anaesthesia n (%)	General anaesthesia n	Total
Fetal distress	51 (56)	2	53 (50.5)
Pre-ruptured uterus	13 (14.3)	5	18 (17.2)
Obstructed labour	11 (10.5)		11 (10.5)
Malposition	1 (1.1)		1 (1)
Pre eclampsia	5 (4.5)	2	7 (6.6)
Cord prolapse	1 (1.1)		1 (1)
Cord round the neck	2 (2.1)		2 (2)
Pelvic disproportion	3 (3.3)		5 (5)
Retained second twin	1 (1.1)		1 (1)
Failed labour	2 (2.1)		1 (1)
Retro Placental Hematoma	1 (1.1)	1	2 (2)
Eclampsia		2	2 (2)
Placenta praevia with Prepartum haemorrhage		2	2 (2)
Total	91	14	105 (100)

Table 2: *Indications for emergent cesarean (n = 105).*

Anesthesia was provided by nurse's anesthetists without medical doctor supervision. Pre anesthetic evaluation was performed in operating room by nurse anesthetists. Most women were ASA 2 (79%) or 3 (19%). Mallampati score was not evaluated in 103 cases (98%). Women were all considered to have full stomach. Blood testing was done in 71 cases showing three cases with severe anemia (3 g/dl, 5 g/dl and 4.3 g/dl). No woman was transfused or premedicated against aspiration. Three women received oxygen supply in labor room.

SA was performed in 91 cases versus 12 cases of GA. Two Failed Spinal Anesthesia (FSA) were recorded and converted to GA. 60.95% (n = 64) red code cases, 11.42% (n =12) orange code and 27.6% (n = 29) green cases were recorded. Most (50.4%) patients with red code had SA. Figure 1 shows the anesthesia technique according to emergency code.

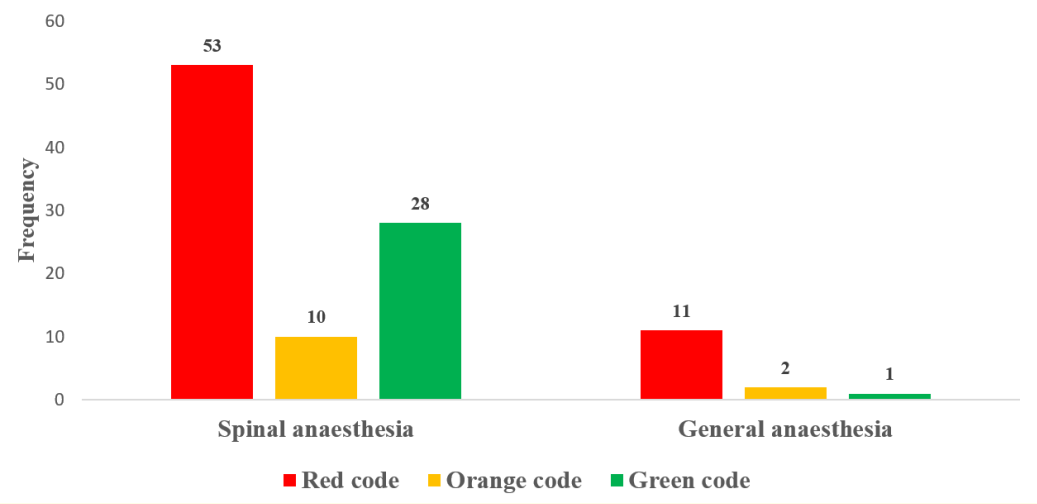

Figure 1: *Anesthesia technique performed according to emergency code (n =105).*

Patients undergoing SA received intravenous infusion of 500 to 1000 ml of normal saline or Ringer Lactate. Induction was done in sitting position, with 10 mg of isobaric bupivacaine (0.5%) and l 25 µg of fentanyl. A standard dose of morphine (50 µg) was used in addition in 63.7%. After induction, women were placed in supine position with a left lateral tilt in 79.1%. The SA success was evaluated by motor and sensitive test. Hypotension was recorded in 90.1% and managed by saline infusion associated to ephedrine. Two patients developed total spinal anesthesia which was managed by GA with face mask, oxygen, saline loading, ephedrine and manual ventilation. The mean dose of oxytocin (15.8 ± 3.8 UI) was given by direct intravenous administration with hypotension in 84.7%.

During GA, an intravenous pre-load of 750 ml of saline was gave to patient in left lateral tilt position. Propofol and succinylcholine were used for induction. Rapid sequence induction (RSI) was not performed and all the patients were ventilated via face mask before intubation. 85.7% of women with GA had hypotension managed by ephedrine 8.4 ± 4.2 mg.

Hypotension was main (14.3%) complication in post-operative period (Table 3). Post-operatively pain was managed by acetaminophen 1 mg each 8 hours and nefopam 20 mg each 8 hours intravenously. The mean value of Visual Analogic Scale (VAS) was 28 ± 9.5 mm at 24 hours and 11.6 ± 8.7mm at 48 hours post operatively. Pain was mainly mild (68.1%). Deep venous thromboembolism (DVTE) was prevented by early mobilization.

Variables	General Anesthesia n (%)	Spinal Anesthesia n (%)	p
Hypotension	2 (14.3)	7 (7.7)	0.8
Nausea/Vomiting	2 (14.3)	4 (4.4)	0.3
High Blood Pressure	5 (35.7)	2 (2.2)	0.7
Headache	2 (14.3)	3 (3.2)	0.2
Delayed awakening	2 (14.3)	0	0.07
Dizziness	3 (21.4)	0	0.2
Anaemia	8 (57.1)	3 (3.2)	0.1
Pruritus	None	7 (7.7)	0.09
Back pain	None	6 (6.6)	0.02
Death	None	None	

Table 3: *Maternal post-operative morbidity according to anesthesia technique (n = 105).*

Table 4 compares neonatal morbidity and mortality according to type of anesthesia. The mean decision-delivery time was 56.1 ± 47.8 minutes for the GA group versus 66.8 ± 63.6 for SA group.

Characteristics	General anesthesia n (%)	Spinal Anesthesia n (%)	p
Mean Apgar score at 1 min	5.7 ± 3.6	7.7 ± 2.3	0.006
Mean Apgar score at 3 min	6.6 ± 3.8	8.8 ± 2.2	0.0002
Mean Apgar score at 5 min	7.4 ± 4.1	9.2 ± 2.3	0.002
Respiratory distress	4 (28.5)	9 (8.5)	0.4
Neonatal infection	1 (6.2)	5 (5.5)	0.09
Neonatal death	3 (21.4)	3 (3.3)	0.7
Baby alive[a]	13 (81.2)	91 (96.8)	0.1

Table 4: *Neonatal morbidity and mortality according to anesthesia technique (n = 105).*

a: Some women have twin (n = 5).

In both techniques most (84% for SA versus 92.2% in GA) were delivered within 60 minutes. Incision to delivery interval was significantly shorter under GA than SA (p = 0.02). Table 5 describes these intervals.

Time interval (minutes)	Mean (minutes)	IC 95%	p
Decision to anesthesia Interval			
All	66.7		
Red code	60.8 ± 48.8	8 - 320	0.4
Orange code	84.1 ± 23.4	32 - 412	0.1
Green code	69.3 ± 17.2	24 - 260	0.2
Incision to delivery Interval			
All	6.6 ± 2.1	2 - 14	
Red code	6.6 ± 2.2	2 - 14	0.2
Orange code	7.2 ± 1.8	5 - 10	0.4
Green code	6.1 ± 1.8	4 - 11	0.6
Decision to delivery Interval			
All	74.3	5 - 126	0.3
Red code	67.4 ± 51.1	16 - 137	0.5
Orange code	91.3 ± 22.7	68 - 120	0.4
Green code	75.6 ± 15.4	50 - 92	0.9
Spinal anesthesia	66.8 ± 63.6	4 - 130	0.02
General anesthesia	56.1 ± 47.8	8 - 112	

Table 5: *Decision-to-delivery interval (n = 103).*

Reasons for anesthesia delay were recorded in 22 cases. The main reasons were unavailability of the anesthetist (40.9%) and lack of oxygen in OR (18.2%)

Discussion

In this study, ECS rate was high 77.7% like what was reported by other authors in LMICs [8]. Eshiet., *et al.* [9] in Nigeria reported 60%, Alabi., *et al.* [10] in South Africa 78.1%. In Lahore, Javed., *et al.* [11] reported 88.9% of emergency cases. In developing countries, women do not have good antenatal care. They often go late to health care facilities which increases the indications for CS. In our study, the majority of women were housewives living in rural areas which are often isolated with poor communication, transport, and climatic barriers. Roads are in poor condition; there are long travel distances and lack of basic infrastructure that make it difficult for women to get to appropriate facilities. Consequently, they arrive late with fetal or maternal emergencies. In developed countries, the usual rate of CS deliveries is around 20% in Europe, higher in US (30%) and even in the United Kingdom [1]. The rate of CS may reach 90% in Brazil (92.6%) [12]. In contrast, Singapore reports a low rate (2.7%) [13].

Women were young, the majority aged between 15 to 34 years. In a prospective study nationwide in Burkina Faso, Filipi., *et al.* [14] reported an average age of 25.6 years. Our data were similar to those reported by Pete., *et al.* [15] in Ivory Cost (29.1 years) and by Benzouina., *et al.* [8] in Morocco. This mean age corresponds to the period of high fertility and data reflect sociodemographic characteristics of the Burkinabe population, 77.3% of this population live in rural areas and 51.7% of women are about 21.8 years [16]. In our report, the majority of women were referred from less well-equipped healthcare facilities (72.4%). No women had medical assistance during transfer. In Burkina Faso, Lankoandé., *et al.* [17] reported a maternal referral rate of 43%. Pete., *et al.* [15] reported comparable findings in Ivory Coast. Referred women often present in poor condition, with prolonged labor and ruptured membranes after having had multiple vaginal examinations. Thus, the exhausted women often require emergent delivery. Youth, immaturity, non-medical transport conditions and delay in medical consultation are some issues well described in sub-Saharan countries [18,19].

The main indication for ECS was fetal distress, followed by uterine pre rupture syndrome. In Singapore, Lim., *et al.* [13] found that fetal distress was the cause of ECS in 68.4% of cases. In the literature, many studies found comparable results [6,11,15] although others found differently [9]. Our findings reported a red code in 60.1%, an orange code in 11.4% and a green code 27.6%. Pete., *et al.* [15] in Ivory Coast found that 42.3% were red code and 57.7% were orange or green. In France, Huissoud., *et al.* [7] found that 59.5% were ECS but only 5.5% was red code. In developed countries, women generally have good antenatal care and early consultations which reduce complications.

No women were transfused even though three women had severe anemia (≤ 5 g/dl). This fact is due to unavailability of blood in the hospital. In rural areas, blood is given by patients' relatives and transfusion is a major issue for practitioners [20]. Because of unavailability of medicines, women did not have pulmonary aspiration prophylaxis even though they were considered to have full stomachs. In our study, we did not see pulmonary aspiration but it is recommended to implement this practice for all cases of full stomach.

Only nurse anesthetists gave anesthesia in this study. RHO doesn't have an anesthetic doctor. In Burkina Faso, anesthesia is generally administered by nurses. They mainly have two years of training. This condition of training does not allow them to develop good skills. In other country like Zimbabwe anesthesia was also provided mainly (77%) by nurses [1]. The WFSA survey state that Africa area is poor in anesthetist particularly medical doctor. SA was the most common because it is considered safer than GA. This technique is commonly used for CS [21,22]. Lim., *et al.* [13] found however that GA was most used for ECS. In our study, most of red color cases were operated on under SA. Red color denotes an urgent situation where women have to be delivered within 15 minutes and RSI is recommended alternatively to SA [5,6,11,13]. The anesthetic technique for CS is usually decided on depending on several factors such as urgency, the patient's existing systemic problems, patient preference, and the experience and choice of the anesthetist. But in an emergency situation, the anesthetic choice may depend mainly on the urgency to deliver the baby and the clinical condition of the patient. In Lahore, Javed., *et al.* [11] found that 94.7% of ECS were done under SA while 5.2% were GA. In red color CS, RSI is commonly used because this technique is faster to

perform than conventional SA [23]. RSI is currently being challenged due to risk of hypoxia, aspiration, choice, and doses of drugs [24]. A specific approach to SA called rapid sequence spinal anesthesia for red color obstetric cases has been described [4]. A randomized study [25] showed that anesthesia delivery time was shorter in RSGA compared to SA. In developing countries like Burkina Faso, the lack anesthetic doctors, reduced skill levels, insufficiency of equipment for adequate ventilation, and lack of drugs make SA the preferred option.

In our study, decision to delivery time was 67.4 minutes in red code cases. There was a delay in anesthetic management four times greater than the recommended duration. In Ivory Coast [15], the average time between admission and pre-anesthetic consultation was 90 minutes for all categories. No women gave birth within 30 minutes of decision in our study. Lim., *et al.* [13] in Singapore reported a mean decision to section time of 3.5 minutes and all women were anesthetized within 10 minutes regardless of the qualification of the surgeon, anesthetist and time of the intervention. In our series, the delay of anesthetic management was long which complicates maternal or fetal prognosis. The mean time for fetal extraction was lower in red code than in orange (6.63 versus 7.23 minutes). This average time was 2.7 minutes according to Lim., *et al* [13]. In both anesthetic techniques, the majority of women were delivered within 60 minutes in our study. The fetal extraction time was acceptable but the delay in anesthetic management was long, thus increasing maternal-fetal morbidity and mortality. In the morning, there are two anesthetists in each operating room but, on call, there only two nurse anesthetists for obstetric and general surgery emergencies. On call when there is an emergency in both surgery and obstetrics, nurses work alone in each OR which reduces patient safety. Increased anesthetic staff, promotion of team work, with good organization could reduce delay prior to delivery.

Under SA, 94 newborns were delivered including 91 live and 3 stillborn babies. Complications seem to be related to delay more than to the type of anesthesia. SA was associated with a good Apgar score compared to GA. The adaptation of newborns is faster after SA than GA [13,15,20,26]. 16 newborns were delivered after GA, of whom three were admitted to neonatology and three died. The Apgar score was significantly lower after GA. SA promotes a rapid adaptation of the newborn to extra-uterine life [9,27], whereas the GA promotes per-operative complications [8]. Among women undergoing SA, a brief loss of consciousness, with hypotension was observed in 2.2%, due to total spinal anesthesia. Under GA, hypotension was observed in 85.7%. Vomiting was recorded in two cases. Alabi., *et al.* [10] in South Africa found 11.7% of failed SA in elective caesarean versus 12.3% in ECS. The incidence of failed SA varies in the literature and depends on the skills of the anesthesia provider [1,4,5,10,11,13]. No maternal deaths and no major maternal morbidity was recorded in our study.

This study has limitations due to low numbers and the fact that causes of delay were insufficiently reported. Medical decisions were poorly recorded. The data collection was interrupted due to the investigator's participation in anesthesia courses.

Conclusion

Anesthesia for ECS is common in RHO. It accounts for most of the anesthetic activity. There is a deficiency in the organization and the quality of anesthetic care. The emergencies were mostly referred and the delay in anesthetic management was unacceptable. This needs to be addressed. Pre-anesthetic evaluation was insufficient and was performed in the operating room. Potentially dangerous management (GA with mask, ventilation on full stomach) is still described. SA was the main technique. Neonatal mortality was frequent. SA promotes better postnatal adaptation of newborns. The presence of an anesthetic doctor and updating of the anesthetic nurses' knowledge might improve anesthetic care and reduce maternal and neonatal morbidity and mortality.

Ethics Approval and Consent

Approval was obtained from the Regional Hospital of Ouahigouya (RHO) Research Committee.

Consent for Publication

Not applicable.

Availability of Data and Materials

The data of this study are available from the corresponding author (Lankoande Martin m.hamtaani@gmail.com, 15 BP 106 Ouagadougou 15).

Competing Interests

The authors declare that they have no competing interests.

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Author's Contributions

Simporé André: Help to design protocol.

Bonkougou P: Read and make correction.

KI B Bertille: Help to improve quality of paper and english language.

Ouédroago Issa: Give authroization to carry out the study in his facility.

Kaboré RA Flavien: Read, analyse and improve of this paper.

Ouédraogo Nazinigouba: Corrected final version of the paper.

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