ADDIS ABABA UNIVERSITY-COLLEGE OF HEALTH SCIENCES SCHOOL OF MEDICINE, TIKUR ANBESSA SPECIALIZED HOSPITAL

CHALLENGES OF PROVIDING SAFE OBSTETRIC ANESTHESIA IN BLACK LION SPECIALIZED HOSPITAL: CROSS-SECTIONAL SURVEY

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A RESEARCH PAPER SUBMITTED TO THE DEPARTMENT OF ANESTHESIOLOGY, ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCE, SCHOOL OF MEDICINE IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR SPECIALITY CERTIFICATE IN ANESTHESIOLOGY.

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Outlines

List of abbreviations

BLH	-Black lion hospital
WFSA	-World Federation Society of Anesthesiology
TASH	-Tikur Anbessa Specialized Hospital
WHO	-World Health Organization
ECG	-Electro-echocardiogram
OR	-Operation Room
OBS	-Obstetrics
CS	-Cesarean section
LMICs	- low-and middle-income countries
LB	- Live birth
MDG	-Millennium Development Goals
PI	-Primary Investigator

Abstract

Background:, Despite recent advances in surgery and anaesthesia which significantly improve safety, many health facilities in low-and middle-income countries (LMICs) remain chronically under-resourced with inability to cope effectively with serious obstetric complications (Knight et al., PLoS One 8:e63846, 2013) The United Nations 2015 Millennium Development Goals targeted a 75% reduction in maternal mortality. However Ethiopia has one of the highest rates of mortality in Africa. Because many of these deaths could likely be averted with access to safe surgery and anesthesia, this research is set out to assess the capacity to provide safe anesthetic care for mothers in the main referral hospital of the country.

Objectives: The main aim of this research is to explore the gaps which need to be addressed to provide safe obstetric anaesthesia in the TASH.

Methods: A hospital based cross sectional, simple descriptive study was conducted among physician and non-physician anesthesia providers in TASH, in the months June and July 2019, to assess availability of trained personnel, equipment and medication necessary to provide safe obstetric anesthesia according to WFSA and WHO guidelines. Anesthesia providing personnel were interviewed using a questionnaire based on the World Federation of the Societies of Anesthesiologists (WFSA) international standard guidelines for safe anesthesia.

Findings: Using the WFSA checklist as a guide, the hospital did not have all the necessary requirements needed to provide safe obstetric anesthesia. Availability of monitors and life-saving equipments was limited. For estimated population of 7.8 million in 2019 only in Addis Ababa, there were only 10 anesthesiologists in TASH, even though it's the biggest tertiary referral teaching hospital in the country.

Conclusion: Significant shortages of continuous education, equipments and medications needed to provide safe anesthetic care for obstetric surgical cases was identified in TASH. These shortages have significantly affected anesthesia safety and compliance with international standard guidelines for safe anesthesia care. More funding is required to improve resources and trainings of the anesthesia service providers, if the hospital is to improve the quality of health care and patient safety regarding safe practice in anesthesia for obstetric patients.

1 Introduction

Cesarean section is one of the skilled delivery interventions that have proven to be a life-saving procedure. The outcome of cesarean section is highly influenced by not only surgical safety but also appropriate use and administration of anesthesia.

The United Nations 2015 Millennium Development Goals targeted a 75% reduction in maternal mortality which remains high in most low-and middle-income countries. Ethiopia has one of the highest rates of mortality in Africa. In Ethiopia, the MMR between 1990 and 2015 ranged from 266–1667 per 100,000 Live Births (LB).[1]

Despite recent advances in surgery and anesthesia which significantly improve safety, many health facilities in low-and middle-income countries (LMICs) remain chronically under-resourced with inability to cope effectively with serious obstetric complications (Knight et al., PLoS One 8: e63846, 2013). As a result, many of these countries still have unacceptably high maternal and neonatal mortality rates. Recent data at the national referral hospitals in East Africa reported that none of the national referral hospitals met the World Federation of Societies of Anesthesiologists (WFSA) international standards required to provide safe obstetric anesthesia.[2]

As part of the Health Sector Transformation Plan (HSTP), Ethiopia aspires to reduce MMR to 177 deaths per 100,000 LB in 2020. Moreover, in the post-MDG era, the Sustainable Development Goal (SDG) targets achieving MMR of 70 per 100,000 live births in 2030.[3]

Hence, in order to track future targets and assess the impact of government initiatives, reliable and valid evaluation of quality of intrapartum care is paramount. The experience integrating quality control tools into routine practice is a limited, although many of these deaths

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[1] The millennium development goals report 2015 (http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf)

[2] Epiu I: Challenges of Anesthesia in Low-and Middle-Income Countries. WFSA; 2014 (http://wfsa.newsweaver.com/Newsletter/p8c8ta4ri7a1wsacct9y3u?a=2&p=47730565&t=27996496)

[3] Ethiopia Health Sector Transformation Plan – Global Financing Facility (https://www.globalfinancingfacility.org/sites/gff_new/files/Ethiopia-health-system-transformation-plan.pdf)

could likely be averted with access to safe surgery and anesthesia, including caesarean delivery.

This research is set out to assess the capacity to provide safe anesthetic care for mothers in BLH. Although evaluating the quality of one hospital at a single point in time might be limiting the generalizability of the findings, identifying the gaps and limitations of BLH would be an eye opener and indicator towards hospitals all over, as BLH is the main referral hospital of the country with generally better privileges and performances. It also could serve as a pilot study to take on a nationwide study in the future.

1.1 Statement of the problem:

Obstetrics is therefore critical to public health, with safe surgery and safe anesthesia being critical components of comprehensive emergency obstetric care. Anesthesia is one of the medical specialties which sought to improve the quality of health care and patient safety in these regions by setting standards for safe practice in anesthesia that were adopted by the World Federation of Societies of Anesthesiologists (WFSA).[4]

Maternal deaths arise from risks attributable to pregnancy and childbirth as well as from poor-quality care from health services. They result from a wide range of indirect and direct causes. The top five leading causes of maternal deaths that contributed more than three quarter of deaths in Ethiopia between 1990 and 2013 were direct maternal causes such as complications of anesthesia, embolism (air, amniotic fluid, and blood clot), and the condition of per partum cardiomyopathy (25.7%) followed by complications of abortions (19.6%), maternal hemorrhage (12.2%), hypertensive disorders (10.3%), and maternal sepsis and other maternal infections such as influenza, malaria, tuberculosis, and hepatitis (9.6%). Indirect causes attributable to pre-

[4] Merry A, Cooper J, Soyannwo O, Wilson I, Eichhorn J. An iterative process of global quality improvement: the international standards for a safe practice of anesthesia 2010. Can J Anesth. 2010;57(11):1021–6

existing or concurrent diseases that are not complications of pregnancy itself but are aggravated by it (e.g. cardiac disease or HIV/AIDS) represent the rest of total deaths.[5]

Cesarean Section is one of the lifesaving surgical intervention that decrease maternal and perinatal mortality and morbidity. The frequency of cesarean section is 0.6% for Ethiopia which is very low. The prevalence of CS in Addis Ababa determined to be 31.1% as compared with 58.7% in Private/Non-Governmental Hospitals. The national cesarean section rate in Ethiopia varies greatly, with the higher rates being in the referral hospitals of the country. There was an institutional CS rate of 31.8% in St Paul hospital, for example, one of the biggest referral hospitals in the country. The greater the number of referrals in a hospital, the more complex the services offered, and the greater the number of CS. The overall postoperative morbidity rate associated with cesarean births is 35.7%. The higher mortality and morbidity rates might be attributable not only to the surgical procedure but also to the anesthetic technique preferred. [6]

Anesthesia for Cesarean section has gained importance as the cesarean birth rates have increased. A fifteen years' (1996-2010) obstetric anesthesia trend analysis in Gonder, an Ethiopian University Hospital determined that GA was still a predominant anesthetic technique (65.6%) compared with SA. Even though the cesarean procedure has become very safe over the years, it is still associated with high rates of maternal and perinatal mortality and morbidity. The overall postoperative morbidity rate associated with cesarean births is 35.7%. The higher mortality and morbidity rates might be attributable not only to the surgical procedure but also to the anesthetic technique preferred.[7] Another study in two Hospitals in Addis Ababa showed

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[5][5] Trends and causes of maternal mortality in Ethiopia during 1990-2013 (https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4071-8)

[6] Hussen Aman, Shiferaw Negash, and Lukman Yusuf: Cesarean delivery practices in teaching public and non-government/private MCH hospitals, Addis Ababa *Ethiop. J. Health Dev* 2014; 28(1)

[7] Zewditu Abdissa Denu et al: Trends in Obstetrics Anesthesia at Gonder University Hospital EC Anaesthesia 2.2 (2015): 99-105

among 1,713 deliveries, with overall cesarean section delivery prevalence of 32.5%; spinal anesthesia was used in 68.2%.[8]

1.2 Rationale of the Study

In order to demand better resources, trainings for the anesthesia providing staffs, and develop management protocols for obstetric patients requiring anesthesia, we need to know the actual setup and practice in the hospital. There were no researches done on safe obstetric anesthesia in TASH, so the main aim of this research is to know the practical aspect of the current conditions, and based on this study, to show the hospital administration the need to increase the number of anesthesiologists, to improve the training of non-physician anesthesia providers as well as formulate a way for sustainability of basic minimal necessities required to provide safe obstetric anesthesia. Future improvements in safety of anesthesia care will be determined by how the hospital incorporates this research into its resource allocation and clinical practice.

[8] Spinal anesthesia for cesarean delivery at two teaching hospitals in Addis Ababa, Ethiopia (http://www.emjema.org/index.php/EMJ/article/view/715)

2 LITRATURE REVIEW

In a cross-sectional survey study conducted from February 2013 to March 2014 at five East African Community National Referral Hospitals: in Burundi revealed a significant shortage of both the personnel and equipment needed to provide safe anesthetic care for obstetric surgical cases across East Africa, with minimum requirements. Only 4% (3 of 85) of the anesthetists interviewed had access to the facilities with up to 8 of the variables. Only 58% of the anesthesia providers had heard about the WFSA international guidelines for safe anesthesia and reported inadequate supervision (54%) of emergency conditions. frequent mal functioning and lack of regularly serviced and intermittent supply of electrodes, deficiency in ventilation monitoring, precordial stethoscope, and capnography were not always used in the national referral hospitals.[9]

Another study that collected providers perspective in Ethiopia indicated a large proportion of hospital of all levels in most part of the country are unable to provide safe general, spinal, paediatric and obstetric anaesthesia. Lack of equipment, pharmaceuticals, anesthetists problems with professional recognition and a lack of access to continuing professional development were listed as key barriers to service development. [10]

Among one hundred and five anesthesia providers in Ethiopia that participated in another similar survey, 61% reported they practice regional anesthesia, but utilization of regional anesthesia for labour pain was almost nil. Eighteen percent of the anesthetists reported they were satisfied with the quality of education received from their education source.[11]

In another retrospective descriptive cross-sectional study conducted in Finoteselam hospital, Northwest Ethiopia in 2015, Among 2267 deliveries in the two years of retrospective data (from September 2013 to December 2015), 250 (11%) mothers were delivered by cesarean section, 85.2% had emergency CS, and 56% of CS were made by general anesthesia. The overall

[9] Challenges of Anesthesia in Low and Middle income countries (https://www.ncbi.nlm.nih.org/m/pubmed/27918334)

[10] Anaesthesia in Ethiopia: providers' perspectives on the current state of service Nov 15, 2013 (https://doi.org/10.1177/0049475513512642)

[11] Practice of regional anesthesia and analgesia in Ethiopian hospital (http://academicjournals.org/journal/IJMMS/article-full-text-pdf/329049F55492)

neonatal and maternal mortality rate in the hospital were, 206 (90.8) and 8 (353) per 1000 live births) respectively, out of which 42 (12 per 1000 live births) and 3(16.8%) mothers were attributed due to cesarean section delivery. Among mothers who delivered by cesarean section, one-third (28%) of the mothers develop one or more complication following CS delivery.[12]

A task analysis study in Ethiopian anesthetists reported, among the total study participants, more than half rated 72.9% of the tasks as being highly critical to patient outcomes, and reported that they performed 70.2% of all tasks at a high frequency. More than a quarter of respondents reported that they performed 15 of the tasks at a low frequency. Nine of the tasks rated as being highly critical were not learned during pre-service education by more than one-quarter of study participants, and over 10% of respondents reported that they were unable to perform five of the highly critical tasks.[13]

In a retrospective study conducted in St. Paul's Hospital, out of 2345 deliveries 582 were by cesarean section procedures making the institutional cesarean section rate of 24.8%. Perinatal Asphyxia (PNA) was the most common cause of the neonatal death 6 (42.9%). Dystocia (26.4%) and emerged as the leading indication for ECS followed by non-reassurance fetal heart rate pattern (NRFHRP) (18.8%).[14]

Similar study in TASH, retrospective one-year medical record review of major pregnancy related problems admitted and managed as an emergency cases were 92% with gestational age of 28 weeks & above, 5.8% abortion, 2.0% ectopic pregnancy and 0.2% gestational trophoblastic disease. Mal-presentation (13.1%), uterine rupture (12.5%) and obstructed labor (11.9%), were

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[12] Cesarean section rate, Maternal and Fetal Outcome of birth following cesarean section at Finoteselam Hospital, Northwest Ethiopia (GLOBAL JOURNAL OF MEDICAL RESEARCH: GYNECOLOGY AND OBSTETRICS Volume 16; Issue 3; version 1.0 year 2016)

[13] Education, Practice, and Competency Gaps of Anesthetists in Ethiopia (https://www.sciencedirect.com/science/articles/abs/pii/S1089947217300473)

[14] Ayano B, Guto A. Indications and Outcomes of Emergency Caesarean Section at St Paul's Hospital Medical College, Addis Ababa, Ethiopia 2017: (Afoul Month Retrospective Cohort Study). Gynecol Reprod Heal. 2018

the leading causes of perinatal and early neonatal mortality rates (91.8 and 26.1/1000 births each) respectively. The maternal mortality ratio was 1107.5/100,000 live births and the top three-implicated causes were post-abortal complications (28.9%), eclampsia (21.1%) and ruptured uterus (15.8%). About half (48.9%) of the total causes of perinatal deaths were mechanical factors, predominantly obstructed labor that could have been totally averted if the system of basic obstetric care was properly established. Preventable obstetric complications such as abortion, eclampsia and uterine rupture are still the foremost causes of maternal deaths.[15]

[15] Emergency Obstetric performance with emphasis on operative delivery outcomes (Ethiopian journal of health development 18(2) January 2005)

3 Objectives

General Objective:

- To identify gaps which need to be addressed to provide safe obstetric anaesthesia in TASH.

Specific Objectives

- To identify shortages of minimum requirements regarding personnel
- To identify shortages of minimum requirements regarding equipment and
- To identify shortages of minimum requirements regarding medications needed to provide safe anesthetic care according to international WFSA guidelines

4 METHODS

4.1 Study setting

This study was carried out in Tikur Anbessa Specialized Hospital. The Hospital is found in Addis Ababa, the capital city of Ethiopia, with estimated population of 3,384,569 according to the 2007 population census. Tikur Anbessa Specialized Hospital is the largest tertiary public hospitals in Addis Ababa and the entire country, serving as a referral center from all over the nation and a teaching center for bachelor, masters and PhD level health professionals of different disciplines. TASH has a total of 800 beds, 80 of which are currently being used in obstetrics and Gynecology ward. About 3000 deliveries are attended each year and 60% of these are operative deliveries. The hospital has more than 11 functional operating theaters, including the obstetric OR.

4.2 Study design

A cross-sectional simple descriptive in-depth interview design, with document review and observation of the operating theater for obstetric patients on the availability and functionality of anesthesia equipment; and interview of anesthesia providing personnel in TASH and its recovery room were conducted from the month of June to July 2019.

4.3 Data collection and analysis

4.3.1 Data collection

A structured, close ended questionnaire was adopted from the WFSA guidelines and used to collect data in English. Based on the international guidelines, requirement of professional capacity and socio-demographic, educational back ground and experience; and availability of drugs, supplies and anesthesia equipment's were assessed.[16,17] The questionnaire was pre-tested in six anesthesia providers who were not included for the study and necessary changes (e.g., wording and layout, matching response options to questions readability, applicability, and ease of understanding) were made to ensure the survey questionnaire would return good data.

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[16] International Standards for a safe practice of Anesthesia 2010

[17] WHO 2009 safe surgery checklist (http://www.who.int/patientsafety/information_centre/documentts/en/index.html)

All on duty anesthesiologists, except those who were on long leave during the study period and professionals with experience less than one year were contacted to explain the purpose of the study and asked if they are willing to participate. Consent was obtained from each individual. Additionally, Theaters were checked for the availability of minimum requirements.

Quality assurance:

Contact information of the PI was provided in case there are questions and inquiries. Questions were handled on a case-by-case basis by the researcher. In an effort to minimize non-response error, distributed questionnaire was checked for completion upon return.

4.3.2 Data analysis and Interpretation

Data was entered, cleaned and analyzed using the Statistical Package for Social Sciences (SPSS) software version 24. Descriptive and analytical statistics were used as applicable and compared with the WFSA and WHO guidelines. Statistically significant association was taken for p values of <0.05.

4.3.2.1 Study Variables

- Socio-demographic data – Age, sex, address, religion, participant's level of education, marital status, still in training or completed, years of experience in anesthesia
- Level of education
- Duration and time of exposure/experience in the OR
- Number and work habit of anesthesia professionals
- Standard procedural practice
- Availability of drugs and equipments necessary for anesthesia

4.3.2.2 Eligibility criteria

Inclusion criteria

- Physician (consultant anesthesiologists) and non-physician anesthesia providers who has worked in the Obstetrics OR for one year or more (year 2 and 3 residents also participated)

Exclusion criteria

- Experience in the OR less than a year
- Unavailability of the staff in the hospital (for study, maternity leave...)

4.4 Ethical consideration

Ethical clearance was obtained from the Department of Anesthesiology in CHS. Respondents were clearly informed about the purpose of the study and the information required from them. It was explained for them that there wasn't going to be any risk or harm on the participants associated with the study. They were also told that they had the full right of non-involvement and the right to stop the interview at any point in time. Verbal agreement was then obtained from all the study participants and participant confidentiality was assured. All participants included in the study were kept anonymous during subsequent analysis and dissemination.

5 Result

Socio-demographic and Educational characteristics

Out of 82 anesthesia service providers in the hospital, 65 participated. The response rate was 100% but the response of two participants who declined to disclose their socio-demographic characteristics were excluded from analysis. As shown in Table 1 below, the mean age of the study participants is 30 years and 93% are less than 34 years. Male professionals constitute 60%, majorities (63%) were physician anesthesiologist and, majorities (70%) of the participants were having less than 3 years' experience as anesthesia service providers.

Table 1: Socio-demographic and Educational characteristic of study participant's anesthesia service provider

Characteristics	Response	N	%
Age	24-34 years	57	93
	35-44 Years	2	3
	Greater than 44 Years	2	3
Sex	Male	38	60
	Female	25	40
Level of Education	still in training	35	56
	completed training	28	44
Qualification	Consultant Anesthesiologists	5	8
	Anesthesia Residents	35	56
	BSC/Master anesthetist	23	37
Years of Experience	1- 3 year	44	70
	3-5 years	7	11
	6-10 years	10	16
	Greater than 10 years	2	3

Safe anesthesia practice

During the study, it was observed that there was only one operating room dedicated solely for obstetric patients in the hospital. The proportion of agreement on availability of assistant who knows how to give cricoid pressure and ability to catch up with new obstetric anesthesia technology by themselves were 67% and 54% respectively and 66% said there is no sufficient continuous education activity. Fifty four percent agreed that they perform pre-anesthetic evaluation in all obstetric cases and 60% say they always check patient's preoperative informed consent. Eleven percent of the study participants agreed on the occurrence at least one intra-operative cardiac arrest in the previous one year. The agreement for the question, if patients are always taken care for at least half an hour during post-operative period was 54%.

Regarding the appropriate usage of monitors during spinal anesthesia, displayed in table 2, high proportion of agreement on practice was seen in the questions 54.0% in general, but high rate of disagreement was observed on the questions concerning thermometer (81%) capnography and end tidal measurement (79%) and defibrillator (81%) usage.

Table 2: Showing summary of usage of monitors during spinal anesthesia

2	**Usage of monitors during spinal anesthesia**	**agreed**	**%**
2.2	Always have pulse oximeter during spinal anesthesia	60	95
2.3	Always have automated blood pressure monitor during spinal anesthesia	54	86
2.4	Always have manual blood pressure monitor during spinal anesthesia	31	49
2.5	Always have ECG during spinal anesthesia	63	100
2.6	Always have thermometer during spinal anesthesia	12	19
2.7	Always have capnograph and end tidal measurement during spinal anesthesia	13	21
2.8	Always have stethoscope during spinal anesthesia	61	97
2.9	Always have defibrillator during spinal anesthesia	12	19
	Average	**34**	**54%**

Medications

For the questions covering the availability of selected medications, the average response by 69% of the participants said the medications are always available and 29% replied to have shortage sometimes.

Table 3: Summary of availability of medications in the OR

	always present	Sometimes present	Never present
Antacids	**28 (43%)**	**37 (57%)**	**-**
Sedatives	**47 (72%)**	**18 (28%)**	**-**
Anti-hypertensives	**33 (51%)**	**26 (40%)**	**6 (9%)**
Vasopressors	**41 (63%)**	**24 (37%)**	**-**
Antibiotics	**56 (86%)**	**9 (14%)**	**-**
Spinal Drugs	**40 (62%)**	**25 (39%)**	**-**
General Anaesthetics I.V	**52 (80%)**	**13 (20%)**	**-**
Gaseous anaesthetics	**56 (86%)**	**9 (14%)**	**-**
Muscle relaxants	**51 (78%)**	**14 (22%)**	**-**
Opioid analgesics	**36 (55%)**	**27 (42%)**	**2 (3%)**
Non opioid analgesics	**47 (72%)**	**18 (28%)**	**-**
Oxytocin	**56 (86%)**	**9 (14%)**	**-**
Average	**69%**	**29%**	**1%**

Monitors and equipments

Regarding equipments, 91% of respondents said they always perform Preanesthetic checklist of anesthesia machine and circuit. They all agreed that they monitor each case with ECG, and all but one agrees with pulse oximeter as well. Defibrillator and difficult airway cart isn't available in the OR. Ninety two said suction machine is available for each case, but it is to be noted that a single machine is shared between the surgical and anesthesia team, to the contrary of the WFSA recommendation.

Table 4: Summary of the availability of monitors

	Availability of Monitors	**Present and functioning**	%
1	Pulse oximeter	63	100
2	Automated blood pressure monitor	59	94
3	Manual blood pressure monitor	32	51
4	ECG	63	100
5	Thermometer	16	25
6	Canograph and end tidal measurement	0	0
7	Stethoscope	57	90
8	Defibrillator	0	0
	Average	36	57%

5. Discussion

The international standards for safe practice of anesthesia were recommended by WFSA for anesthesia professionals throughout the world. In resource-limited settings, minimum, mandatory standards are often not met. Provision of anesthesia under such circumstances should be restricted to procedures that are essential for the urgent or emergency saving of life. In spite of this, the hospital continues to conduct elective as well as emergency surgeries.

Providing access to timely surgical care delivered by adequately trained and resourced health care providers is the key to High-quality obstetric anesthesia and reducing maternal and fetal deaths during operative interventions for childbirth. Many mothers need more than basic obstetric care. In developing country like Ethiopia, many women present to secondary institutions with life-threatening complications. Additional lives could be saved if the anesthesia service provider was skilled at recognizing the need for, and was able to carry out, timely and effective resuscitation.

Timing of appropriate and safe surgical intervention has been shown to be critical in preventing maternal death and disability because most perinatal deaths occur during labor and delivery or within the first 48 hours thereafter. The three-delay model identifies some of the readily addressable factors, for which the first two delays (delay in deciding to seek care and delay in reaching appropriate care) relate directly to the issue of access to care, including factors in the family and the community. The third delay (delay in receiving care at the health facilities) relates to factors specifically at the health facility, including quality of care. Ironically, it is crucial to address the third delay first because it would be of limited value to facilitate access to a health facility if it was not well staffed, well equipped, and provided good quality care. In spite of programs to improve access, these obstacles act as bottlenecks that prevent better provision of safe anesthesia.

WFSA emphasizes the presence of an appropriately trained anesthesia provider with access to recommended monitors and minimum facilities for safe perioperative care and availability of appropriate post-anesthesia care services. With a population of 7.8 million according to world population review only in Addis Ababa, there were only 10 consultant anesthesiologists in the institution. But the fact that TASH is a tertiary referral hospital which

accepts referrals from different parts of the country and attends more than 3000 deliveries each year, from which 60% are operational deliveries, makes the scarceness even more pronounced.

Although availability of a fully trained anesthetist throughout surgery is a basic requirement in the WFSA standards, 66% admitted to not having sufficient continuous education activity to catch up with new obstetric anesthesia technology and only 55% agreed that they can catch up with new obstetric anesthesia technology. This will have an effect on the professional incompetence and failure to cope up with recent advancements in the field.

Availability of monitors and equipment is agreed by more than half of participants. As compared to the international reference, some monitors and equipments such as capnography, thermometer, defibrillator and availability of difficult airway cart aren't available in the OR for the service providers to use even though pregnancy by itself is an indication of difficult airway. Incidence of intraoperative cardiac arrest in previous one year was also reported by 11% of respondents, although there is no defibrillator in the OR to provide appropriate advanced cardiac life support. Granting response regarding availability of ECG monitoring was grossly encouraging, supply of ECG lead electrodes is non-existent forcing service providers to improvise with duct tape which is substandard. The service providers are also expected to have their own stethoscopes individually, otherwise none available in the OR.

Regarding anesthesia drugs, 72% of the study participants agree that there is no shortage or interruption of these selected lists. However, essential drugs such as anti-hypertensive, vasopressors, opioid analgesics, or even spinal anesthesia drugs are reported to lack sometimes.

Compared to the expected obstetric care the Hospital ought to give, it is a critical shortage. TASH is also a teaching hospital, with expected better access to continuous education, because of relatively better opportunities to guest foreign staffs and drugs and equipment's donated from the foreign alliances. The anesthesia service providers lacking access to continuous professional development and medical education on managing obstetric emergencies despite this advantage is also an eye opener towards the possibility of the scenario being much worse in other hospitals of the country.

6 Conclusion and Recommendations

The challenges anesthesia service providers are facing in TASH include a critical shortage of international minimal requirements evidenced by poor continuous education system, poor facilities and infra-structure, lack of basic drugs, equipment, and supplies. Therefore, these shortages have significantly affected anesthesia safety and compliance with international standard guidelines for safe anesthesia care at the main referral and teaching hospital of the country.

Recommendations

- Policy focus and more funding is required for improving the operation room, drugs, equipments and supplies
- Improvement of the training of physician anesthesia service providers in line with as well as continuing medical education for Non-physician anesthetists is mandatory

7 Strength and limitation of the study

Strength of the study

The study tried to assess the difficulties of providing safe obstetric anesthesia in TASH which has not been studied previously using a questionnaire designed according to an international guideline.

Limitation of the study

The study lacks some practical observation due to the study period collides with time of reconstruction of the obstetrics and operating theatre limiting the cross-check of equipment and materials that are actually available and functional in the operating theater

8 REFERENCES

1. The millennium development goals report 2015 (http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf)

2. Epiu I: Challenges of Anesthesia in Low-and Middle-Income Countries. WFSA; 2014 (http://wfsa.newsweaver.com/Newsletter/p8c8ta4ri7a1wsacct9y3u?a=2&p=47730565&t=27996496)

3. Ethiopia Health Sector Transformation Plan – Global Financing Facility (https://www.globalfinancing facility.org/sites/gff_new/files/Ethiopia-health-system-transformation-plan.pdf)

4. Merry A, Cooper J, Soyannwo O, Wilson I, Eichhorn J. An iterative process of global quality improvement: the international standards for a safe practice of anesthesia 2010. Can J Anesth. 2010;57(11):1021–6

5. Trends and causes of maternal mortality in Ethiopia during 1990-2013 (https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4071-8)

6. Hussen Aman, Shiferaw Negash, and Lukman Yusuf: Cesarean delivery practices in teaching public and non-government/private MCH hospitals, Addis Ababa *Ethiop. J. Health Dev* 2014; 28(1)

7. Zewditu Abdissa Denu et al: Trends in Obstetrics Anesthesia at Gonder University Hospital EC Anaesthesia 2.2 (2015): 99-105

8. Spinal anesthesia for cesarean delivery at two teaching hospitals in Addis Ababa, Ethiopia (http://www.emjema.org/index.php/EMJ/article/view/715)

9. Challenges of Anesthesia in Low and Middle income countries (https://www.ncbi.nlm.nih.org/m/pubmed/27918334)

10. Anaesthesia in Ethiopia: providers' perspectives on the current state of service Nov 15, 2013 (https://doi.org/10.1177/0049475513512642)

11. Practice of regional anesthesia and analgesia in Ethiopian hospital (http://academicjournals.org/journal/IJMMS/article-full-text-pdf/329049F55492)

12. Cesarean section rate, Maternal and Fetal Outcome of birth following cesarean section at Finoteselam Hospital, Northwest Ethiopia (GLOBAL JOURNAL OF MEDICAL RESEARCH: GYNECOLOGY AND OBSTETRICS Volume 16; Issue 3; version 1.0 year 2016)

13. Education, Practice, and Competency Gaps of Anesthetists in Ethiopia (https://www.sciencedirect.com/science/articles/abs/pii/S1089947217300473)

14. Ayano B, Guto A. Indications and Outcomes of Emergency Caesarean Section at St Paul's Hospital Medical College, Addis Ababa, Ethiopia 2017: (Afoul Month Retrospective Cohort Study). Gynecol Reprod Heal. 2018

15. Emergency Obstetric performance with emphasis on operative delivery outcomes (Ethiopian journal of health development 18(2) January 2005)

16. International Standards for a safe practice of Anesthesia 2010

17. WHO 2009 safe surgery checklist
(http://www.who.int/patientsafety/information_centre/documentts/en/index.html)

18. Epiu I, Bahe Tindimwebwa JV, Mijumbi C, Ndarugirire F, Twagirumugabe T, Lugazia ER, et al. Working towards safer surgery in Africa; A survey of utilization of the WHO safe surgical checklist at the main referral hospitals in East Africa. BMC Anesthesiol. 2016;

19. Deye, N., Vincent, F., Michel, P., Ehrmann, S., Da Silva, D., Piagnerelli, M., … Laterre, P.-F. (2016). Changes in cardiac arrest patientsâ€TM temperature management after the 2013 â€œTTMâ€• trial: Results from an international survey.

20. Bashford T. Anaesthesia in Ethiopia: Providers' perspectives on the current state of the service. Trop Doct. 2014;

21. Merga H, Nega D, Leulayehu A. Practice of regional anesthesia and analgesia in Ethiopian hospital. Int J Med Med Sci. 2015;

22. Merry AF, Cooper JB, Soyannwo O, Wilson IH, Eichhorn JH. International standards for a safe practice of anesthesia 2010. Can J Anaesth. 2010;57:1027–1034.

9 Declaration of the Investigator

I Dr. Selam Tebeje will take the full responsibility of executing the research as described in the methodology, abide by the ethical clearance regulation, if applicable; commit to regular monitoring of activities and financial conduct by the office of the vice president for research and Dean of the school of post-graduate studies. I declare that I have not started the implementation of the project before submitting the proposal**.**

10. Annexes

Annex 1: Initial Contact of the PI

Hi my name is Dr Selam Tebeje Eshete. I am conducting a research study to assess challenges of delivering safe obstetric anesthesia in black lion hospital. This is a survey to establish the quality of anaesthesia care provided to Obstetric patients. The information is important for us in order to identify gaps in our service that hamper us from delivering safe and quality care to our patients who come to the hospital to deliver. You are being asked to participate in this study because you have been providing anesthesia care for mothers who have had caesarian delivery in the hospital for one year or more. I would like you to participate in the study by providing insight regarding resources based on your experience while working in the obstetrics OR. The extent of your involvement will be completing this questionnaire, which should take approximately 5-10 minutes.

You are under no obligation to agree to participate and your decision will have no effect on your job. It should also be noted that the aim of this questioner is not to evaluate the knowledge or practice of the service provider rather to assess our service in general thereby opening a door for improvement. If you decide to participate, be assured, your information will be kept confidential. The results from this study may be used for publication. However, your name will not be used in any reports. Your privacy and confidentiality will be kept to the full extent required by law. I appreciate you taking a moment to help me with this important research.

Do you have any questions for me?

Phone number: 0911811556

Email address: selamtebeje27@gmail.com

Thank you for your time!

Annex 2: Questionnaire

A. ANAESTHESIA PROVIDER DERMOGRAPHIC DATA

1. Study Number

2. Age

3. Gender

4. Physician or Nurse Anesthetist?

5. Are you still in training or completed training?

6. How many years of experience do you have in anesthesia?

B. OPERATIONAL DATA–(Tick appropriate answer)

1. You use a pre-anaesthetic surgical checklist on all patients

Agree ☐ Disagree ☐

2. Sometimes surgical checklist is not used because

It is not clear ☐ It is not available ☐

3. You know about the International Guidelines for Safe Anaesthesia care for Obstetric Patients?

Agree ☐ Disagree ☐

4. You perform pre-anesthetic evaluation in all obstetric cases

Agree ☐ Disagree ☐

5. You always check patient's preoperative informed consent

Agree ☐ Disagree ☐

6. You always check patient's identification and type of surgery

Agree ☐ Disagree ☐

7. There are adequate anesthesia personnel in your department

Agree ☐ Disagree ☐

8. If they are inadequate, how much more do you need?

20% ☐ 30% ☐ 50% ☐ › 50% ☐

9. You always have an assistant who knows how to give cricoid pressure?

Agree ☐ Disagree ☐

10. Continuous education activity in your department is sufficient

Agree ☐ Disagree ☐

11. Supervision in your department is adequate

Agree ☐ Disagree ☐

12. In the past year at least one of your patients had intra-operative cardiac arrest

Agree ☐ Disagree ☐

13. Supervision in your department regarding emergency condition is adequate

Agree ☐ Disagree ☐

14. Number of Emergency Caesarean Sections done in your Hospital per day

.....

15. Time from decision to perform Emergency Caesarean Section, to actual surgery

.....

16. Reasons for delay

No anesthetist ☐ No Surgeon ☐ Equipment fault ☐

Other …… ……

17. You can catch up with new obstetric anesthesia technology

Agree ☐ Disagree ☐

18. More than 50% of your obstetric patients receiving anesthesia were firstly evaluated in the operating room

Agree ☐ Disagree ☐

19. You usually monitor your patients' ventilation during (GA) using…

	Always used	Sometimes used	Never used
Stethoscope			
Reservoir bag movement			
Capnography			

20. Anesthesia practice always strictly complies with clinical practice guidelines

Agree ☐ Disagree ☐

C. EQUIPMENT

21. You always formally perform pre-anesthetic checking of anesthetic machine and circuit

Agree ☐ Disagree ☐

22. You monitor patient with electrocardiography (EKG) in every case

Agree ☐ Disagree ☐

23. You use a nerve stimulator on all patients with neuro muscular blockade

Agree ☐ Disagree ☐

24. You monitor patient with pulse oximeter in every case

Agree ☐ Disagree ☐

25. You always have suction available for each case

Agree ☐ Disagree ☐

26. You sometimes experience miscommunication during anesthetic practice

Agree ☐ Disagree ☐

27. You have all monitors on during spinal anesthesia

	Present	Functioning	Absent
Pulse oximeter			
Automated blood pressure monitor			
Manual Blood Pressure monitor			
ECG			
Thermometer			
Capnograph and end tidal measurement			
Stethoscope			
Defibrillator			

28. You have IV perfusers available for use

Agree ☐ Disagree ☐

29. You have a difficult airway cart, available for emergency difficult airways

Agree ☐ Disagree ☐

30. In the past 3 months, you experienced medication error

Agree ☐ Disagree ☐

31. You always have a nerve stimulator when using neuromuscular blocking drugs

Agree ☐ Disagree ☐

D. RECOVERY

32. Your patients are always taken care of (Monitored and followed) for at least half an hour during postoperative period

Agree ☐ Disagree ☐

33. All of your patients are taken care of in the recovery room

Agree ☐ Disagree ☐

34. Your patients have pain relief

24 hrs ☐ 48 hrs ☐ › 48 hrs after surgery ☐

35. In the past year, you experienced at least a case of dental injury

Agree ☐ Disagree ☐

36. You have basic ICU services available, dedicated for monitoring any obstetric post op patient

Agree ☐ Disagree ☐

DRUGS AND EQUIPMENT CHECKLIST

1. DRUGS

	Drug which are always present?	Sometimes present?	Never present?
Antacids			
Sedatives			
Anti-hypertensives (please list)			
Vasopressors (please list)			
Antibiotics			
Spinal Drugs			
General Anaesthetics I.V (list)			
Gaseous anaesthetics			
Muscle relaxants			
Opioid analgesics			
Non opioid analgesics			
Oxytocin			

2. ANAESTHETIC MACHINE

a) Oxygen source

Piped ☐ Cylinder ☐

Other .....

b) Reserve oxygen cylinder

Present ☐ Absent ☐

c) Inspired oxygen recording

Present ☐ Absent ☐

d) Oxygen supply failure alarm

Functioning ☐ Not functioning ☐

e) Low oxygen failure alarm

Functioning ☐ Not functioning ☐

f) Oxygen supply failure alarm (Prevent delivery of hypoxic gases)

Functioning ☐ Not functioning ☐

g) Ventilator

Functioning ☐ Not functioning ☐

h) Mechanical Ventilation disconnection alarm

Functioning ☐ Not functioning ☐

i) Scavenging system

Present ☐ Absent ☐

j) Breathing systems

Present ☐ Absent ☐

3. OPERATING TABLE (tick the appropriate)

a) Present

Yes☐ No☐

b) Number of operating tables present

……

c) Are they functioning (Tiltable)

Yes ☐ No ☐ Other ……

d) Serviced;

Yes ☐ Never☐

If yes what was the last service date?

4. SUCTION MACHINE

a) Present ☐ Absent ☐

b) Functioning ☐ Not functioning ☐

c) Serviced ☐ Not serviced ☐

Last service date

5. MONITORS (tick appropriate response)

	Present	Functioning	Absent	Number
Pulse oximeter				
Automated blood pressure monitor				
Manual Blood Pressure monitor				
ECG				
Thermometer				
Capnograph and end tidal measurement				
Stethoscope				
Defibrillator				

6. AIR WAY EQUIPMENT (tick appropriate response)

	Present	Absent	Number
laryngoscope			
facemasks			
ETT and connectors			
Artificial airways			
Ambu bag			
Magill's forceps			

7. DIFFICULT AIRWAY CART ☐ present ☐ absent

8. Recovery Room

a) Present ☐ Absent ☐

The following are available in your recovery room:

Monitor	Present	Absent	Number
Pulse oximeter			
Automated Blood pressure machine			
Manual Blood pressure machine			
Temperature monitor			
ECG			
Continuous pulse display			
Stethoscope			
Suction Machine			
Oxygen Supply			