



ORIGINAL ARTICLE

Current Status of Obstetric Anaesthesia Services (Oasis): A Cross-Sectional Survey of Public Hospitals in Khartoum State, Sudan

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Abstract

Background: Medical services in general, and anaesthetic services in particular, in Sudan have been vulnerable to changes secondary to socio-economic factors over the last few decades. This cross-state survey aims to identify the current set up of obstetric anaesthesia services in 19 hospitals - representing all public hospitals in Khartoum State with maternity units- and audit them against internationally set standards.

Methodology: This is a cross-sectional descriptive non-interventional study. Questionnaires - built on the World Federation of Societies of Anaesthesiologists (WFSA) Safe Anaesthesia Standards - were sent out to Anaesthetic department's heads at the time of the study (first to fourteenth of May 2016) in 19 public hospitals. This is the total number of public hospitals delivering obstetric services in Khartoum State. All filled out questionnaires were returned (response

rate 100%). Collected information/Data provided were subsequently entered into an Excel sheet and analysed. Results were tabulated.

Results: There was huge variation in the capacity of the surveyed hospitals in terms of human resources, case load and set up. Improper utilization of already deficient anaesthesiologist in covering high load obstetrics services was also noticed. All hospitals fell short of recommendations for minimum standards set by World Federation of Societies of Anaesthesiologists (WFSA).

Conclusion: There is a huge gap between international set standards and current set up of obstetric anaesthesia in Khartoum State public hospitals. Urgent concerted efforts from governmental, non-governmental and professional bodies are warranted to improve obstetric anaesthetic services in Khartoum State.

Keywords

Obstetrics, Anaesthesia, Khartoum

Introduction

In 2015, the WHO estimated that over 303,000 women died in complications of childbirth [1]. The Maternal Mortality rate in Sudan in the same year was estimated to be at 311 per 100,000 lives, ranking it the 40th worst place globally [1]. Ninety-nine per cent of maternal deaths occur in resource-poor countries [2] where access to family planning, antenatal care and emergency obstetric services are limited.

In many developing countries, especially sub-Saharan Africa, there is a critical shortage of healthcare providers and very limited resources [3]. Sudan is no exception. Decades of “brain drain”, insecurity and the economic toll of long-term conflicts impacted negatively on the country’s development in general and healthcare in particular [4].

Anaesthesia services have not been immune to these factors. Nationally, there are too few physician anaesthetists. At the time of this survey, the number of consultant anaesthetists registered with the Sudan Medical Council (SMC) was 378, not all of these are currently practising in Sudan and some of them have passed away in recent years [5]. This has led to anaesthesia frequently delivered by non-physicians (technicians and assistants). Anaesthetic technicians are high school graduates who proceed to receive four years training in college. Anaesthetic assistants on the other hand, are nurses who receive further two years training in anaesthesia. Throughout Sub-Saharan Africa, anaesthesia services are deemed by many, including senior healthcare management, as a low priority speciality and often lack the voice to demand additional resources [6].

To our knowledge, there has been no survey, to date, that quantifies and describes challenges faced by anaesthetists delivering obstetric services in Khartoum State. We believe this is an important step in planning comprehensive and optimum service delivery, effective utilisation of current resources, in addition to adopting a training curriculum which matches needs and is based on local settings.

Methodology

This was a cross-sectional survey conducted in Khartoum State from the first till the fourteenth of May 2016. All public hospitals providing obstetric anaesthesia in Khartoum State were included in the survey. The list of hospitals was provided by Khartoum State Ministry of Health. We developed a survey tool based on WFSA safe standards and the WHO Safety Checklist [7,8]. We also looked into other parameters, such as, number and experience of service providers, equipment availability and medications. Data was collected in a pre-set ques-

tionnaire filled by anaesthesia head department in each enrolled hospital (Annex A). All questionnaires were filled and returned (response rate 100%). The data was entered into Excel sheet and analysed by one of the investigators (TSM). As this survey was non-interventional and did not include human subjects, the need for ethical approval was waived away by the Ethics and Research Committee of the State Ministry of Health, Khartoum State.

Results

There are nineteen public state hospitals which currently deliver obstetric services. Their names and locations were provided by the State Ministry of Health (Table 1). Hospitals affiliated to armed forces (police, military, internal security forces) and privately-owned hospitals were not included in this study, as they enjoy different set of governing systems, financial revenues, set-up and staffing levels. We could not establish how many deliveries occur in these facilities.

There was huge variation in the capacity of the studied hospitals. Three of the hospitals (TRK, OMH and SAU ... all being stand-alone obstetric hospitals) accounted for 66.3% of all in-hospital deliveries. Some units were much smaller with less than 1000 deliveries per annum. One particular hospital (JBT) had only 40 deliveries in 2015. The majority of the obstetric units had a delivery rate between 2000 and 4000 (Table 1).

The number of senior physicians available varied significantly cross these units, so did the availability of junior doctors and non-physician staff (Table 1). While all hospitals had one or more consultant obstetricians among its staff, five of these hospitals had no consultant anaesthetists affiliated to them, head departments in these institutions were either anaesthetic technicians or assistants or had none. There was also considerable variation in the ratio of consultant physician to deliveries, indicating that human resources are probably not uniformly distributed throughout the state. Only six of these hospitals were allocated anaesthetic trainees.

Availability of anaesthetic equipment were uniformly deficient throughout the different hospitals. While almost all hospitals had an anaesthetic machine per room, the obstetric hospital with the highest case load (OMH) reported that none of their 12 machines were fit for purpose. The caesarean section rate in OMH is around 30% [9], accordingly, there are more than 10,000 caesarean deliveries per annum without adequate anaesthesia resources. Six of the hospitals had no ventilators, indicating that lung ventilation was carried out via manual bagging. Fifty-two out of the fifty-eight operating rooms (ORs) designated for obstetric surgeries had one or more pulse oximeter. 12 of the 19 hospitals had readily access to a defibrillator. Five of the investigated hospitals had no facilities to ensure ECG monitoring intraoperatively, while another three reported occasional

Table 1: Distribution of health care staff and equipment in the surveyed hospitals.

	Group A Hospitals with deliveries =/ > 4000 per annum	Group B Hospitals with deliveries between > 1000 < 4000 per annum	Group C Hospitals with 1000 deliver is or more per annum.
Hospitals and abbreviations	Turkish Hospital (TRK), Omdurman Maternity H. (OMH), Ibrahim Malik Hospital (IMH), Soba University Hospital (STH), Chinese Friendship Hospital (CFH), Saudi Hospital (SH)	Ali Abdelfattah H. (AAF), Bahri Teaching Hospital (BTH), Saad Abu AlEla Hospital (SAH), Academy Charity Hospital (KAH), Bashayir Hospital (BH), Haj Elsafi Hospital (HGH), Al-Ban Jadeed Hospital (ABJ)	Garri Hospital (GAR), Al-Jazeera Slang Hospital (AJS), Jebail Al-Tena Hospital (JTH), Um-Dawan Ban H. (UDB), Jabl Awleya Hospital (JTH), Umbadda Hospital (UBH)
No of Obstetric Operating Rooms (OR)	3	2	2
Median (range)	(1-12)	(1-3)	
Deliveries per annum	6885	2700	162
Median (range)	(4000- 36000)	(1600-3860)	(65-700)
No of Consultant Obstetricians per facility	14	4	2
Median (range)	(9-18)	(2-10)	(1-5)
No of Consultant Anaesthetists per facility	4	4	0
	(3-13)	(1-5)	(0-1)
No of anaesthetic machines in the hospital	3	2	2
	(1-12)	(1-3)	(1-3)
No of pulse oximeters in OR	1	2	1
	(1-4)	(1-3)	(1-2)

presence of same.

Only 3 anaesthetic departments were equipped with a difficult airway setup; however, 6 of the other departments didn't have basic airway adjuncts, such as bougies and stylets. Suction apparatus was available in all ORs albeit on demand basis in some of them.

The setup for neuraxial anaesthesia seems to be better established. All anaesthetic departments studied had access to spinal needles. Four hospitals however reported using size 23G and larger size needles. These needles are associated with higher incidences of post dural puncture headaches (PDPH) and their routine use is discouraged [10]. Both lignocaine and bupivacaine are equally available, however ephedrine is the main vasoconstrictor used, as phenylephrine is not licensed in Sudan [11].

Most anaesthetic departments had emergency medications available. Only three however believed that access to blood and blood products was consistent and reliable. WHO regional analysis of maternal mortality in Africa identified haemorrhage, along with hypertensive disorders, sepsis, and pulmonary embolism as the predominant culprits [12].

None of the hospitals investigated had an incubator to transfer neonates in place, only two had a post anaesthetic care unit (PACU) and six had an intensive care unit (ICU) within the premises.

Discussion

To our knowledge, this is the first survey that looked at obstetric anaesthesia services in Khartoum state. The reason we only included Khartoum state in this study was that it is the most populated state in Sudan. The population census conducted in 2008 showed that over 5 million inhabited the capital [13], many believe that this number has doubled in recent years [7,14].

In 2010 the World Federation of Societies of Anaesthesiologists (WFSA) described a list of basic equipment and drugs requirements for delivery of safe anaesthesia [15]. Recommendations specific to delivery of safe obstetric anaesthesia was endorsed by the Anaesthetists Association of Great Britain and Ireland (AAGBI) [16] and the American Society of Anaesthesiologists (ASA) [8]. For caesarean section, the most common obstetric surgery, the requirement was to be able safely to provide adult general anaesthesia and spinal anaesthesia, and to have access to blood transfusion and drugs for the treatment of common obstetric problems such as haemorrhage, pre-eclampsia and eclampsia [17].

Efficient obstetric anaesthesia services are closely related to maternal well-being and pregnancy outcomes. In setting its safety standards, the WFSA recommends that facilities providing caesarean sections, have to be able to provide adult general anaesthesia and spinal anaesthesia safely, and to have access to blood transfusion and drugs for the treatment of common obstetric

problems such as haemorrhage, pre-eclampsia and eclampsia [3,8,17].

Women fertility in Sudan is estimated by the World Bank to be around 4.4 per woman [18]; This, in addition to the exponentially growing urban population resulting from rural to city migration, puts a lot of strain on an already stretched service. When it comes to deliveries, only 18% of births in Sudan are delivered in a healthcare facility, and only 13.2% are delivered in a public hospital [19].

Human resources are the backbone of any service. In this study anaesthetic human resources are both very scant and ill-distributed (Table 1). Currently, a significant portion of obstetric anaesthetic services are delivered by anaesthetic assistants (nurses with 2-year training in anaesthesia) and the newly introduced anaesthetic technicians. This is deemed by many as an unsafe practice; national anaesthetic and perioperative organizations recommend that they are “to be supervised at all times” [20,21]. The presence of a trained anaesthesiologist is a corner stone in patient safety. Anaesthetic technician’s job plan and scope of responsibilities remain to be clearly defined by the Ministry of Health in Sudan [11]. Clear obligatory regulations should be released by the health authorities to limit the unsupervised practice of anaesthetic assistants in locations privileged by physician-anaesthetist-based service. Sudan has preserved the model of stand-alone obstetric hospital it inherited from colonial Great Britain and is found nationwide. Safety and efficiency of such model has undergone immense criticism with more and more countries moving away from it [22-24].

Another point worth mentioning is that some health facilities had very low number of deliveries per annum (Table 1), with one as low as 40 deliveries in total in 2015. A recent study in East Africa concluded that Hospitals with less than 1000 deliveries per year are a major concern, as the caseloads are too low to enable the acquisition or maintenance of skills for safe operative services [25]. Low volume centres are associated with worse outcomes and we believe that redirection of services towards high volume centres would be more resource efficient and safer practise. It has to be taken into consideration however, that Khartoum State extends over an area of more than twenty-two thousand kilometres square. Infrastructure such as paved roads and rail service is poorly developed, with some areas partially accessible during the rainy season. For these, the presence of healthcare units in their area is of paramount importance.

Huge safety leaps in anaesthesia have only been witnessed in the second half of the twentieth century and the beginning of the twenty first. This has been promoted primarily via advances in technology, such as anaesthetic delivery systems, monitoring devices and medications. Most hospitals in this study have shown

critical shortages in all above. No anaesthetic should be delivered without a fully functioning anaesthetic machine. The practise of manual bagging an anaesthetised patient is hazardous and -in the combined absence of capnography - may lead to detrimental effects secondary to hypercarbia, hypocarbia and possible barotrauma. Inadequate set up and improper application of safety measurements when utilizing regional anaesthesia, such as hand hygiene and aseptic techniques in neuraxial blocks, may have severe sequelae. Perioperative support system, e.g. neonatal ICU backup, is a necessity if best outcomes are sought.

Conclusion

Obstetric anaesthesia services in Khartoum are inadequate and are unable to deliver safe service to a large portion of pregnant ladies. Substandard care remains a leading avoidable factor in many maternal deaths, particularly those due to anaesthesia, the majority of which are associated with a lack of skills in basic anaesthesia and resuscitation [26]. An urgent national review by bodies responsible for health services in the country is warranted. As Hodges and Mujambi of Uganda nicely summarised in their article “(studies) are the first step to quantifying and describing the problems faced by anaesthetists in developing countries, and one that can be used by national anaesthesia societies and governments in developing countries to improve management and planning of anaesthesia services, target education and enable limited resources to be used effectively” [25]. Professional bodies, such as Sudan Society of Anaesthesiologists, need to make their voices heard. Minimum standards on safe service delivery need to be agreed upon and audited regularly. This cannot and should not wait. This should happen now!

Conflict of Interest

None.

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Annex (A):**Hospital Data Collection Sheet**

1. Name of hospital.....
2. Number of operating theatres in hospital.....
3. Number of operating rooms delivering obstetric services.....
4. Number of consultant obstetricians affiliated to the hospital.....
5. Number of consultant anaesthetists affiliated to the hospital.....
6. Number of anaesthetic registrars.....
7. Number of anaesthetic technicians.....
8. Number of anaesthetic assistants.....
9. Number of maternal deliveries in 2015.....
10. Number of beds in labour ward.....

Are the following equipment and monitors available in your institution for obstetric surgeries **around the clock**?

Item	Always	Sometimes	Never	Remarks
Functioning anaesthetic machines				no. of machines
Ventilators				No of vent
Pulse oximeter				No. of devices
Capnography				
BP measuring devices				
ECG monitoring				
Arterial lines (invasive BP monitoring)				
Central lines				
Laryngoscopes				
Disposable endotracheal tubes				
Buggies/stylets				
LMAs				
Difficult intubation aids (iLMA, McCoy blades, videoscopes)				Commonest available
	Always	Sometimes	Never	Remarks
Suction apparatus				
Operating table with tilting capabilities				
Equipped Neonatal incubator				
Defibrillators				No in theatres
Sterile gloves				
Spinal needles				Commonest size
Epidural needles				
bupivacaine				
Lignocaine				
IV anaesthetic drugs (thio, propofol, ketamine)				Commonest used in CS
Suxamethonium				
Anaesthetic vapour				Commonest available
Air cylinders				
N ₂ O cylinders				
Atropine				
Ephedrine				
phenylephrine				
adrenaline				
Blood products				
Uterotonics (oxytocin, ergo,etc)				Commonest available
Magnesium Sulphate				
Recovery area				No of spaces
HDU				No of beds
ICU				No of beds