

Caesarean delivery: An experience from a tertiary institution in North Western Nigeria

CN Daniel, S Singh

Department of Obstetrics and Gynaecology, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

Abstract

Objective: To assess the overall caesarean section (CS) rate, indications and outcomes in a tertiary hospital in North-western Nigeria.

Materials and Methods: A cross-sectional study carried out over a period of two years. All patients who had caesarean section at any time within the day were noted and followed up till discharge. The socio-demographic data, types of CS, anaesthesia, indications, abdominal wall and uterine incisions, cadre of surgeon and fetomaternal outcomes were documented in a proforma. Statistical analysis was carried out using the EPI INFO 3.5.1 (CDC Atlanta Georgia, USA).

Result: The caesarean section rate was 11.3% (504/4462) of total deliveries. The highest rate of 44.6% (225/504) was among the primipara. The most common age group involved was 25 to 29 years. The emergency rate was 57.1% (288/504), while elective CS constituted 42.9% (216/504) of cases. The most common indication for emergency CS was obstructed labour 25.7% (30/288) and previous CS 39.8% (86/216) for elective CS. The complication rate was 13.3% (67/504) and the main complication was haemorrhage 59.7% (40/67). Complications were more with emergency CS compared to elective surgery ($\chi^2 = 6.633$, $df = 1$, $P < 0.01$) and with junior residents ($\chi^2 = 15.9$, $df = 1$, $P < 0.001$). There were 10 maternal and 60 perinatal deaths.

Conclusions: The rate of caesarean section has been increasing gradually. There is need to improve on facilities and manpower in order to reduce morbidity and mortality.

Key words: Africa, Caesarean section, indications, outcome

Date of Acceptance: 20-Apr-2015

Introduction

Caesarean section (CS) is one of the oldest and the most commonly performed obstetric operation in the world with over a third of women in many developed countries undergoing CS when they give birth.^[1] It constitutes about 25% of all deliveries in many countries.^[1,2] Over the past 25 years, there has been a sustained increase in CS rates (CSRs) around the world with massive public interest and debate, on the appropriateness of this increase.^[2] The CSR in the United States of America (USA) rose from 20.7% in 1996 to 31.1% in 2006, while in England and Wales, the CSR is between 21% and 24.2%.^[3,4] The increasing use of CS as a mode of delivery in Europe and the USA is because of fear of malpractice litigation, increased

use of epidural anesthesia and electronic fetal monitoring, convenience of the physician, and social indications.^[4] Brazil has one of the highest CSRs in the world, as over 27.9% of babies are delivered by CS.^[5] Socioeconomic status and requests for sterilization by tubal ligation were important underlying factors for the high CSR in Brazil.^[5] In Maiduguri Nigeria, the CSR showed a steady increase over the years, from 7.2% in 2000 to 14.0% in 2005.^[6] Studies from other centers in Nigeria have reported rates ranging from 10.3% to 34.5%, with private medical centers reporting relatively higher rates.^[7-10] The main indications for CS in these studies were; previous caesarean delivery, cephalopelvic disproportion, breech presentation, preeclampsia/eclampsia,

Address for correspondence:

Dr. CN Daniel,
Department of Obstetrics and Gynaecology, Usmanu Danfodiyo
University Teaching Hospital, PMB 2370, Sokoto, Nigeria.
E-mail: dc.nnadi@gmail.com

Access this article online

Quick Response Code:



Website: www.njcponline.com

DOI: 10.4103/1119-3077.164350

PMID: 26755213

multiple pregnancy, and fetal distress. The World Health Organization (WHO) in 1985 stated that “there is no justification for any region to have a CSR higher than 10–15%.”^[11,12] Rates more than 15% are considered to cause more harm than good. Countries with CSRs < 10% are considered to show underuse, while those with rates from 10% to 15% are considered to have adequate use of CS.^[11,12]

Many studies have shown that a higher caesarean delivery rate is not necessarily associated with better perinatal outcomes and has even been associated with increased risk of fetal and neonatal mortality and morbidity, compared with spontaneous vaginal delivery.^[13,14] Furthermore, the risks of severe maternal morbidity and mortality associated with caesarean delivery are higher than those with vaginal delivery, even after adjustment for risk factors.^[5,11]

The increasing use of CS as a mode of delivery is due to improved safety of the procedure as a result of increasing use of antibiotics, blood availability, and improved anesthetic techniques. Despite all these, problems of safety and cost still pose some concern, particularly in resource-poor countries. These, coupled with the quest for high parity and socio-cultural influences involved in childbirth have resulted in a strong aversion to CS in many African settings. There is thus need to monitor and reduce the caesarean delivery rate in Nigeria and indeed most underdeveloped nations.

Because of the increasing use of CS as a mode of delivery and the safety of the procedure in recent times, it is a good practice to perform periodic assessment of the surgery in a tertiary health institution like Usmanu Danfodiyo University Teaching Hospital (UDUTH) Sokoto. A recent publication from this center by Panti *et al.*^[7] was based on retrospective data with its inherent limitations. This is a prospective cross-sectional review of the CS as seen in this center over a 2-year period.

Aim

The aim was to assess the overall CSR and indications for the CS in a tertiary hospital in North-Western Nigeria. It also aims to ascertain fetal and maternal outcomes associated with the procedure and make recommendations based on the findings.

Materials and Methods

This was a cross-sectional study of caesarean deliveries in a tertiary health institution in North-West Nigeria.

Setting

The UDUTH, Sokoto is a tertiary health institution situated in the North-Western region of Nigeria. It provides tertiary healthcare services to Sokoto, Kebbi, Zamfara, and Niger states. It also receives referrals from the Niger

republic, a neighboring country. The predominant ethnic group is the Hausa/Fulani, but other Nigerian ethnic nationalities like Ibira, Nupe, Yoruba, and Ibo among others are also present in the state. The major religion is Islam, but Christians and traditional worshippers are also represented. The hospital has 600-bed spaces and is located in Sokoto North-Western Nigeria. It acts as a major referral center for high-risk obstetric cases from health institutions located within and outside the environs. The hospital runs residency programs in obstetrics and gynecology, surgery, internal medicine, pediatrics, public health among other specialties. The institution is accredited for both the undergraduate and postgraduate medical training. Most of the clientele of the hospital belong to the middle and low-income status.

Study design

A descriptive longitudinal cross-sectional study carried out in a tertiary hospital over a period of 2-year from 1st July 2009 to 30th June 2011. About 4000 deliveries take place annually in the hospital. The obstetrics and gynecology department has two labor suites one each for the booked patients and referred cases. There is a functional obstetrics theatre adjacent to the main labor room. All patients who had a CS at any time within the 24-h period were noted and followed-up till discharge. Consent for the research was obtained verbally and in written forms. Women who had a caesarean hysterectomy following uterine rupture were excluded from the study.

Definitions

the CSs performed were divided into two groups on the basis of the following definitions which are endorsed by the Royal College of Obstetricians and Gynecologists:^[15] elective CS-(at a time to suit the patient and the maternity team (obstetrician, anesthetist, neonatologist, and the nursing team); emergency CS; (when there is immediate threat to the life of the woman or fetus).

Relevant information such as the sociodemographic variables, type of CS, indications, type of anesthesia given, nature and types of anterior abdominal wall and uterine incisions, cadre of surgeon, postpartum blood loss, fetal and maternal outcomes, were extracted from the case notes and operation files and documented in a proforma. The duty residents were informed about the study and were trained to fill the proforma immediately after the surgery. The hospital's committee on ethics and research approved the study.

Statistical analysis of the results was carried out using the EPI INFO 3.5.1 (CDC, Atlanta Georgia USA). The results were expressed in frequencies, means, percentages, tables, figures, and charts. The Chi-square test (χ^2) was used for association at $P < 0.05$ at 95% confidence interval.

Results

During the study period of 1st July 2009–30th of June 2011 (a period of 2-year), the total deliveries within the hospital were 4462, out of which 504 were through Caesarean operations. This gave a CSR of 11.3% (504/4462) of total deliveries. The age distribution of the subjects is shown in Table 1. The age range of the subjects was between 15 and 50 years and the modal age was within the 25–29 age brackets. About 67.9% (342/504) of the patients were booked for antenatal care, while 32.1% (162/504) were not booked. The parity distribution of the subjects was shown in Table 2. The highest rate of CS 44.6% (225/504) is found in the primipara. They were followed by the grand multiparas

Table 1: Age distribution of the case subjects

Age range (in years)	Number	Percentage
15-19	38	7.5
20-24	93	18.5
25-29	151	30.0
30-34	107	21.2
35-39	80	16.9
40-44	31	6.2
45-50	4	0.8
Total	504	100.0

Table 2: Parity distribution of the case subjects

Parity	Number	Percentage
0	16	3.2
1	225	44.6
2	68	13.5
3	46	9.1
4	40	7.9
5	26	5.2
>5	83	16.5
Total	504	100.0

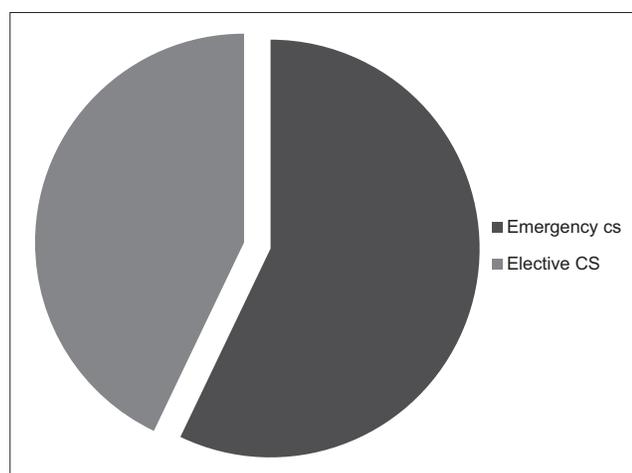


Figure 1: Types of caesarean sections

16.5% (83/504), while the primigravidae had the lowest rate of 3.2% (16/504). CS was performed for emergency reasons in 57.1% (288/504), while elective CS constituted 42.9% (216/504) of cases as shown in Figure 1.

The most common indications for emergency CS were prolonged obstructed labor 25.7% (30/288) and preeclampsia/eclampsia 10.7% (31/288), while the least indications were fetal mal-presentation and breech in labor at term 1.5% (4/288) respectively. Previous CS was the most common indication for elective CS 39.8% (86/216), followed by breech at term 17.6% (38/216), while the least indication was placenta previa 2.8% (6/216) as depicted in Figure 2.

General anesthesia was utilized in 53.2% (268/504) of cases, spinal 43.5% (219/504) and combined general and spinal anesthesia in 3.3% (17/504) of Caesarean operations. This option is practiced when spinal anesthesia fails or when patients develop respiratory distress during the course of surgery. Epidural anesthesia was not used in any case.

The Pfannenstiel incision was the preferred type of anterior abdominal wall incision in 75.8% (382/504) of cases, the midline sub-umbilical incision in 22.2% (112/504), and the Joel-Cohen's was used in 2.0% (10/504). The uterine incisions were lower segment transverse in all cases. Bilateral tubal ligation was performed alongside CS in 5.6% (28/504) of cases.

There were 514 babies delivered during the period of study of which 98.1% (504/514) were singletons, while 1.9% (10/514) were multiple gestations. The sex distribution of the neonates showed a preponderance of males 55.5% (280/514) over females 44.5% (234/514). The birth weight of the neonates ranged from 500 g to 5000 g. They included very low birth weight 0.1% (1/514), low birth weight 12.5% (64/514), normal birth weight 80.4% (413/514), and macrosomic neonates 7% (36/514), respectively. Three hundred and thirty neonates (64.2%) had good Apgar scores, 24.7% (127/514) had moderate asphyxia, while 9.1% (47/514) had severe birth asphyxia. There was a significant relationship between the fetal Apgar scores and the type of CS. Low 1st and 5th min Apgar scores were more with emergency cases compared to elective CS ($\chi^2 = 30.60$, $df = 1$, $P < 0.001$; $\chi^2 = 4.62$, $df = 1$, $P < 0.003$) as shown in Table 3.

During the period of study, there were 60 perinatal deaths, thus giving a perinatal mortality rate of 119.1/1000. Majority 81.7% (49/60) of them were peripartum and early neonatal deaths. This was as a result of prolonged obstructed labor and birth asphyxia among the referred cases. Some of the perinatal deaths 8.3% (5/60) were observed in multiple gestations especially in situations where the second twin had been retained.

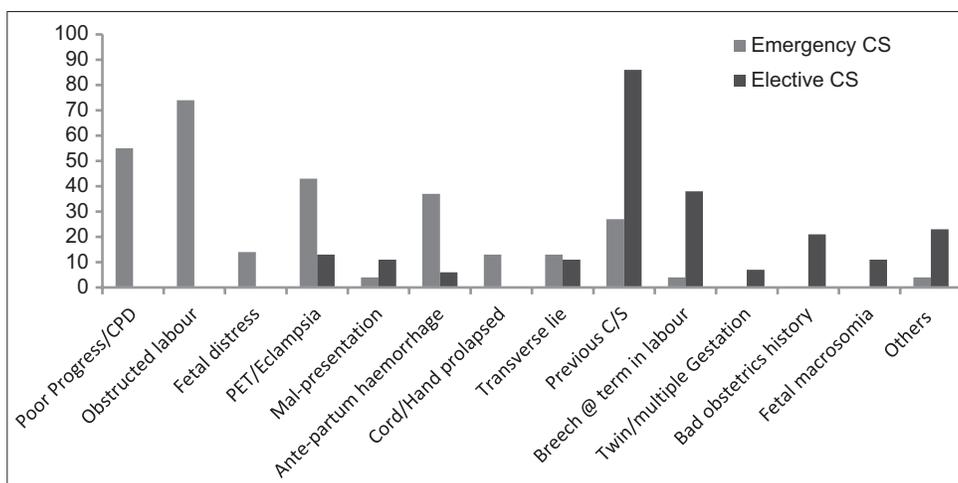


Figure 2: Indications for emergency/elective caesarean sections

Table 3: Comparison in Apgar scores between elective and emergency CS

1 st min apgar scores		
Apgar	Elective CS	Emergency CS
0-3	20	52
4-6	206	220
≥7	9	7

$\chi^2=11.25, df=2, P<0.004$

5 th min apgar scores		
Apgar	Elective CS	Emergency CS
0-3	3	21
4-6	31	54
≥7	255	150

$\chi^2=39.6, df=2, P<0.001$

CS=Caesarean section

Table 4: Complications of surgery

Complications	Number	Percentage
Hemorrhage	40	59.7
Wound dehiscence	12	17.9
Anemia	7	10.5
Sepsis	5	7.5
Others	3	4.5
Total	67	100

The main complications of surgery are shown in Table 4. In 13.3% (67/504) of cases, CS was complicated and the main complications were hemorrhage 59.7% (40/67), wound dehiscence 17.9% (12/504), and anemia 10.5% (7/67). Complications of surgery were more with emergency CS compared to elective surgery ($\chi^2 = 6.633, df = 1, P < 0.001$) and was higher in the referred cases as opposed to the booked patients ($\chi^2 = 8.713, df = 1, P < 0.003$). The operation was performed by the unit consultants in 15.5% (78/504) of cases, senior registrars 54% (277/504) and junior residents in 29.5% (149/504), respectively. Surgical complications were related to the cadre of the surgeon. They were more when the procedure was performed by junior residents ($\chi^2 = 15.9, df = 1, P < 0.001$). When taken alone, there was a significant relationship between the degree of postpartum

Table 5: Association between EBL and the cadre of doctors

EBL (mL)	Registrar	Senior registrar	Consultant	Total	χ^2
<500	8	77	18	103	$\chi^2=40.47$
500-999	118	190	54	362	$df=4$
1000-1500	21	10	6	37	$P=0.001$
>1500	2			2	
Total	149	277	78	504	

Relationship between complications of emergency CS and cadre of surgeon

Complications	Registrar	Senior registrar	Total	Percentage
Sepsis	1	2	3	11.1
Wound dehiscence	11	1	12	44.4
Anemia	6	1	7	25.9
Others	1	4	5	18.5
Total	19	8	27	100

Relationship between type of surgery and complications

Complications	Elective CS	Emergency CS	χ^2	P	df
Yes	19	48	6.633	0.01	1
No	197	240			

There is a significant relationship between blood loss and cadre of doctor with $P<0.001$. EBL=Estimated blood loss; CS=Caesarean section

Table 6: Relationship between maternal complications of emergency CS and cadre of surgeons, and the booking status of the patients

Cadre of doctor	Complications		χ^2	df	P
	(Yes)	(No)			
Total	48	240			
Senior registrar	17	134	6.685	1	0.010
Junior registrar	31	106			
Total	48	240			
Booked	15	131	8.713	1	0.003
Not booked	33	109			

CS=Caesarean section

blood loss and the cadre of surgeon as shown in Table 5. The blood loss was inversely proportional to the cadre of the

surgeon ($\chi^2 = 40.47$, $df = 4$, $P < 0.001$). The estimation of blood loss was made using the volume of blood in the calibrated suction machine used during surgery, by counting the numbers of saturated swabs 45 cm × 45 cm (100 ml each), full kidney dishes (500 ml/dish), and fully soaked abdominal packs (200–250 ml each).

There were 10 maternal deaths associated with CS during the study period, giving a case fatality rate of 1.98% or 1 maternal death for approximately every 50 CS done at the hospital during the period of study. The main causes of death were puerperal sepsis following prolonged obstructed labor 60% (6/10) and complications of eclampsia 30% (3/10). Only one patient died from postpartum hemorrhage. Eight of the maternal deaths were among referred patients while 20% (2/10) were booked cases. The causes of death among the booked patients were uncontrollable postpartum hemorrhage related to coagulation failure and complications of eclampsia respectively. The causes of death were based on clinical findings before death as there was no postmortem examination performed on these patients. There is a strong aversion to autopsy in Islam, which is the major religion among the population. Majority, 58.3% (293/504) spent between 3 and 7 days in the hospital, while 3.4% (18/504) patients stayed for more than 17 days in complicated cases [Tables 1-6].

There was a significant relationship between the cadre of doctor and maternal complications. Wound dehiscence was common with registrars and less when the procedure was performed by senior registrars ($\chi^2 = 15.88$, $df = 1$, $P < 0.001$).

Discussion

The CSR of 11.3% found in this study is higher than the previously reported rates of 9.9% and 10.3% from this institution^[7,16] but much lower than the 18.8%, reported from the South-East and very much lower than the 35.5% from the South-West of Nigeria.^[17,18] It is however within the range of 6.4–33.2%^[6,19-21] as reported from other centers in Nigeria and falls within the WHO acceptable limit of 15%.^[11,12] Most of these figures are institutional based and may not reflect the true picture in the general population. These centers have large proportions of high-risk patients attending tertiary and regional public hospitals. However, considering the rising trend in CSR in many centers in Nigeria and in different countries across the globe, the 15% upper limit suggested by WHO as far back as 1985, may be less realistic in recent times taken into account population dynamics in high-income countries like—increasing maternal age at first child, birth weight, shifts in maternal health, and fear of malpractice litigations that may result in more CS.^[12,22]

The majority of the C/S done were emergency 57.1% (288/504) compared to elective surgery 42.9% (216/504). In the

previous reviews from this center, emergency CS constituted 78.2% and 86.4% of caesarean deliveries, respectively.^[7,16] Similar results of 93.7%, 72.8%, 53.6%,^[17,20,21] respectively were noted from studies in other institutions in Nigeria. This is due to high prevalence of obstructed labor among the referred cases that constituted a great proportion of the emergency CS. Institutional delivery is very low in Sokoto, as many patients prefer to labor at home under the influence of traditional birth attendants (TBAs).^[23] The patients only come to the hospital when there are complications during labor and delivery. This calls for the need for education of the public and to monitor and supervise the activities of TBAs in the society. While we recognize their role in healthcare delivery especially in a country like ours where the healthcare facilities are grossly inadequate for the teeming population, the TBAs should be encouraged to avoid harmful practices and to refer patients early enough to health institutions especially in situations where labor is not progressing.

About 67.9% (342/504) of patients were booked for antenatal care and elective repeat CS was the most common indication for CS among these cases. Previous CS is the most common indication for elective CS worldwide.^[24] Due to the absence of continuous intrapartum electronic fetal monitoring to give early signs of uterine scar dehiscence in many resource-poor countries, there will always be a low threshold for repeat CS. Thus, many obstetricians may not always be inclined to practice vaginal birth after a previous CS due to concerns of maternal safety.

In contrast to a previous study where there was a high rate of CS in the primigravidae due to cephalopelvic disproportion,^[7] in this study the highest rate of caesarean operation was seen in the primipara 44.6% (225/504) and the grand multiparous women 16.5% (83/504). This was mainly due to disproportion from fetal malposition and malpresentation, and also due to the high practice of repeat elective CS.

An important finding in this study is the high rate of utilization of the Pfannenstiel incision as the preferred type of abdominal wall incision 75.8% (382/504), even among the junior residents. Many obstetricians in the department prefer this type of incision because wound dehiscence and postoperative incisional hernia are rare and the cosmetic result is better.^[20] The residents thus acquire the skill early in their training and become proficient in it. Other studies had revealed that the midline sub-umbilical incision was mainly utilized.^[17]

There has been a move toward more CSs being performed under regional anesthesia compared to general anesthesia.^[14] In this study, regional anesthesia was utilized in 43.5% (219/504) of cases only while general anesthesia was used in 53.2% (268/504) of cases. New techniques for

regional anesthesia, such as the combined spinal epidural anesthesia and the continuous spinal anesthesia, offer specific advantages, but are currently not utilized in our center.

The major indications for emergency CS remained the same as in the previous review, that is, obstructed labor and previous CS for elective surgery. CS is performed in our institution only when medically indicated, and no cases of caesarean delivery on maternal request were identified in this study.

Our surgical complication rate of 13.3% (67/504) is low compared to the 20.4% observed in a previous study from this institution and 39.3%, 44.4% reported from Benin City and Maiduguri, respectively.^[7,19,25] The higher rate of emergency CS (86.4%) in the previous study compared to this study (57.1%) may have accounted for the lower incidence of complications. The major complication in this study is postpartum hemorrhage 59.7% (40/67) as opposed to sepsis from previous studies.^[7,18,19] However; similar findings were seen in reports from other centers in Nigeria.^[17] The blood loss during CS is often underestimated, particularly when the loss has been large. Risk factors associated with excessive blood loss include grand multiparity, abruptio placentae, abnormal implantation of the placenta, prolonged labor, chorioamnionitis, multiple pregnancies, classical CS, obesity, and general anesthesia as observed in this study.

In this study, there was significant relationship between blood loss and the cadre of surgeon ($\chi^2 = 40.47$, $df = 4$, $P < 0.001$). Maternal complications of surgery were more when the procedure was performed by a junior resident compared to a senior resident ($\chi^2 = 6.685$, $df = 1$, $P < 0.01$). Similarly, birth asphyxia as determined by low neonatal Apgar scores (0–5), were associated more with emergency CS compared to the elective procedure ($\chi^2 = 39.6$, $df = 2$, $P < 0.001$, $\chi^2 = 4.623$, $df = 1$, $P < 0.03$).

The CS mortality rate of 19.8/1000 in this study is also lower than the 28.7/1000 in previous reviews from this center, but it is still high compared to the 7.8/1000 and 15.6/1000 reported from the South-South region of Nigeria.^[7,25,26] This is due to the higher number of referred patients who present for emergency surgery with complications of prolonged labor.

The major cause of death was sepsis following prolonged obstructed labor as reported in other reviews. The most common infecting organisms were *Escherichia coli* and *Klebsiella* species in our center, which tend to resist the conventional antibiotics.^[7] Previous authors have reported that *Staphylococcus aureus* was the most commonly isolated bacteria in surgical-site wound infection following CS.^[27] Prolonged membrane rupture, multiple digital vaginal examinations, and late referral of these patients were the main contributing factors to sepsis. Correct use of partograph in

the peripheral health centers would have detected labors that were deviating from the normal course and facilitated early referral. In a 5 years review of caesarean deliveries in a major public hospital in Northern Greece by Hema *et al.*, out of the 1831 Caesarean deliveries recorded, there was no case of maternal death.^[2] A similar study in Sokoto Nigeria, reported nineteen maternal deaths within a 4-year time frame.^[7]

A growing body of evidence shows higher morbidity and mortality for women and babies experiencing CS with long-term reproductive health outcomes and abnormal implantation of the placenta in subsequent pregnancies. This confirms the importance of reducing unnecessary caesarean births. The increased costs as well as risks of this procedure, physically, socially, emotionally, and economically, do not warrant its use without significant and medical indications. Complications can occur in unexpected cases. The risk for complications is more with emergency CS compared to the elective procedure.^[1,12]

Conclusions

The rate of CS has been increasing gradually. There is a need to improve on the facilities and manpower in order to reduce morbidity and mortality.

Recommendations

The most important strategy to reduce the rate of caesarean deliveries is to decrease the rate of primary CS and to increase the number of vaginal deliveries among women who have had previous caesarean deliveries. Primary CS casts a dark shadow over a woman's obstetric carrier and its reduction requires a multi-disciplinary approach. Early marriage, high parity, and poor institutional delivery rates are common risk factors for caesarean delivery in our area of practice. Modifiable risk factors must be addressed in order to minimize caesarean-related complications.

Limitations of the study

The estimation of blood loss during surgery using the methods stated above may not accurately quantify the actual loss, but it serves as a useful guide.

References

- Dinas K, Mavromatidis G, Dovas D, Giannoulis C, Tantanasis T, Loufopoulos A, *et al.* Current caesarean delivery rates and indications in a major public hospital in northern Greece. *Aust N Z J Obstet Gynaecol* 2008;48:142-6.
- Hema KR, Johanson R. Caesarean section: Techniques and complications. *Curr Obstet Gynaecol* 2002;12:65-72.
- Darj E, Nordström ML. The Misgav Ladach method for cesarean section compared to the Pfannenstiel method. *Acta Obstet Gynecol Scand* 1999;78:37-41.
- Sachs BP, Kobelin C, Castro MA, Frigoletto F. The risks of lowering the cesarean-delivery rate. *N Engl J Med* 1999;340:54-7.
- Barros FC, Vaughan JP, Victora CG, Huttly SR. Epidemic of caesarean sections in Brazil. *Lancet* 1991;338:167-9.
- Geidam AD, Audu BM, Kawuwa BM, Obed JY. Rising trend and indications

- of caesarean section at the university of Maiduguri teaching hospital, Nigeria. *Ann Afr Med* 2009;8:127-32.
7. Panti AA, Tunau KA, Nwobodo EI, Ahmed Y, Airede L, Shehu CE. Caesarean morbidity and mortality in a tertiary health institution in Sokoto, North-West Nigeria. *Orient J Med* 2012;24:7-12.
 8. Ikeako LC, Nwajiaku L, Ezegwui HU. Caesarean section in a secondary health hospital in Awka, Nigeria. *Niger Med J* 2009;50:64-7.
 9. Efetie RE, Umezulike AC, Agboghorama CO. Caesarean section at the National Hospital, Abuja, 1999-201. *ANMINS* 2006;3:34-9.
 10. Igberase GO, Ebeigbe PN, Andrew BO. High caesarean section rate: A ten year experience in a tertiary hospital in the Niger Delta, Nigeria. *Niger J Clin Pract* 2009;12:294-7.
 11. WHO. Appropriate technology for birth. *Lancet* 1985;2:436-7.
 12. Gibbons L, Belizan JM, Lauer JA, Betran AP, Merialdi M, Althabe F. The Global Number and Costs of Additionally Needed and Unnecessary Caesarean Section Performed per Year: Overuse as a Barrier to Universal Coverage. *World Health Report (2010) Background Paper, No 30; 2010.*
 13. Penna L. Management of the scarred uterus in subsequent pregnancies. *Curr Obstet Gynaecol* 2003;13:173-8.
 14. Yeoh SB, Leong SB, Heng AS. Anaesthesia for lower-segment caesarean section: Changing perspectives. *Indian J Anaesth* 2010;54:409-14.
 15. Royal College of Obstetricians and Gynaecologists. Classification of Urgency of Caesarean Section – A Continuum of Risks. RCOG. Royal College of Obstetricians and Gynaecologists. Good Practice No. 11. London: RCOG; 2010.
 16. Nwobodo EI, Isah AY, Panti A. Elective caesarean section in a tertiary hospital in Sokoto, North Western Nigeria. *Niger Med J* 2011;52:263-5.
 17. Obiechina NJ, Ezeama CO, Ugboaja JO. A five-year review of Caesarean section in Nnamdi Azikiwe University Teaching Hospital, Nnewi Anambra State, Nigeria (1st Jan, 2002-31st Dec, 2006). *Trop J Med Res* 2008;12:29-32.
 18. Adekanle DA, Adeyemi AS, Fasanu AO. Caesarean section at a tertiary institution in South-Western Nigeria – A 6-year audits. *Open J Obstet Gynaecol* 2013;3:357-61.
 19. Chama CM, El-Nafaty AU, Idrisa A. Caesarean morbidity and mortality at Maiduguri, Nigeria. *J Obstet Gynaecol* 2000;20:45-8.
 20. Ugwu EO, Obioha KC, Okezie OE, Ugwu AO. A five-year survey of caesarean delivery at a Nigerian tertiary hospital. *Ann Med Health Sci Res* 2011;1:77-84.
 21. Ojiji EE, Dike EI, Anolue F, Chukwulebe A. Appraisal of caesarean section at the Imo State University Teaching Hospital, Orlu, South-Eastern Nigeria. *Internet J Gynaecol Obstet* 2012;16:DOI: 10.5580/2bdf.
 22. Althabe F, Sosa C, Belizán JM, Gibbons L, Jacquerioz F, Bergel E. Caesarean section rates and maternal and neonatal mortality in low-, medium-, and high-income countries: An ecological study. *Birth* 2006;33:270-7.
 23. Ekele BA, Tunau KA. Place of delivery among women who had antenatal care in a teaching hospital. *Acta Obstet Gynecol Scand* 2007;86:627-30.
 24. Naldoo N, Moodley J. Rising caesarean section: An audit of caesarean section in a specialist private hospital. *S Afr Fam Pract* 2009;51:254-8.
 25. Okonta PI, Otoide VO, Okogbenin A. Caesarean section at the University of Benin Teaching Hospital revisited. *Trop J Obstet Gynaecol* 2003;20:63-6.
 26. Etuk SJ, Asuquo EE, Ekanem AD. Maternal mortality following caesarean section at the University of Calabar Teaching Hospital Calabar, Nigeria. *Niger J Med* 1999;8:62-5.
 27. Jido T, Garba I. Surgical-site infection following cesarean section in Kano, Nigeria. *Ann Med Health Sci Res* 2012;2:33-6.

How to cite this article: Daniel CN, Singh S. Caesarean delivery: An experience from a tertiary institution in North Western Nigeria. *Niger J Clin Pract* 2016;19:18-24.

Source of Support: Nil, **Conflict of Interest:** None declared.