

Caesarean Delivery and Neonatal Outcome in a Maternity Unit in the Tropics

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ABSTRACT

Caesarean section remains an alternative route of childbirth, and it is associated with a higher risk of maternal morbidity and mortality, as well as potential impact on neonatal outcome. This study was conducted to evaluate the practice of caesarean section in the study centre and to assess its impact especially on the surgical site and neonatal outcome. A pro forma was specially designed to collect relevant information prospectively from mothers who were delivered through caesarean section. The majority (75.2%) of the caesarean sections were performed as emergency procedures by Senior Registrars. Major indications were intrapartum haemorrhage (10.3%), obstructed labour (9.5%) and two previous caesarean sections (59.5%). The surgical site condition was satisfactory in 89.9% of cases on postoperative day 7. A favourable neonatal outcome was associated with booked status, elective caesarean section and use of subarachnoid anaesthesia. The majority of the caesarean sections were performed as emergencies by Senior Registrars. Adverse neonatal outcome was associated with unbooked status and indications that necessitated general anaesthesia. The unsatisfactory surgical site was associated with unbooked status and use of midline incision for the surgery.

Keywords: *Caesarean delivery, surgical site, neonatal outcome, maternity unit, tropics*

INTRODUCTION

Every female mammal has the intrinsic capacity to procreate. Following conception, the foetus is carried in the mother's uterus and is delivered at the end of the pregnancy. Women have two major modes of childbirth, namely vaginal delivery and abdominal delivery. Vaginal delivery can be through spontaneous or assisted vaginal delivery, whereas abdominal delivery is through caesarean section.^{1,2} In rare circumstances, an extra-uterine pregnancy that is abdominal is delivered through a laparotomy.

Vaginal delivery remains the natural route of childbirth; although, there are situations when this route might prove unsafe for either the mother, the infant or both.^{3,4} Most women the world over desire to have spontaneous vaginal delivery of their babies, not only because it is the natural process of childbirth, but because it is less traumatic, and recovery interval is rapid.^{4,5} When recovery interval is relatively short, return to routine activity can be attained almost immediately. There are however situations when an attempt at vaginal delivery poses grave danger to the life of the mother or baby, thereby rendering vaginal delivery unsafe.⁵

When there is an indication for caesarean section, it serves as a salvage procedure ensuring safety of the mother and survival of the baby.^{6,7} Caesarean delivery may be performed as a planned procedure or as an emergency, depending on the indication. While elective procedures are performed due to predictable risks recognized to be associated with vaginal delivery, emergency caesarean section is often recommended when certain conditions that develop in advanced pregnancy or labour poses grave danger to the mother, the baby or both.^{8,9,10} In the tropics, emergency caesarean section contributes significantly to all caesarean deliveries performed, and these often result from cephalopelvic disproportion or complications that undermine maternal or foetal wellbeing

In modern obstetric practice, surgical skill has improved over the years, coupled with considerable years of surgical experience resulting in a high level of safety of caesarean sections.^{5,7,13} Caesarean delivery should however be performed by a clinician who has acquired considerable knowledge, surgical skill and experience in the surgical procedure to ensure a satisfactory outcome. Notwithstanding, similar to all major surgical operations, caesarean section wounds might be complicated with postoperative infection, especially following emergency caesarean sections.

Postoperative wound infection generally, might be associated with suboptimal sterility of

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the surgical instruments, unsterile operation field and septic surgical techniques. Recognized risk factors associated with caesarean section postoperative wound infection include multiple vaginal examinations during labour, prolonged rupture of foetal membranes and low educational status of the mother.^{14,15} Other risk factors that have been identified are obesity, prolonged operation time and anaemia.^{15,16,17}

Neonatal outcome may vary based on the route of delivery and the timing of caesarean delivery, with regard to whether it was performed as an elective or emergency procedure. Different neonatal outcome may be recorded depending on whether the baby was delivered via spontaneous vaginal delivery, instrumentally-assisted vaginal delivery, elective caesarean delivery or emergency caesarean delivery. Adverse neonatal outcome includes, birth asphyxia, neonatal sepsis, admission to neonatal intensive care unit, neonatal seizures and neonatal death.^{18,19} Recognized risk factors that result in adverse neonatal outcome are intra-operative blood loss, longer operation interval and interventions to assist in the delivery of the infant during at the second stage of labour.¹⁸

Caesarean section is a major obstetric operation that is commonly performed in the University of Uyo Teaching Hospital, and it has possible adverse impact on the mother and her unborn child. This study was designed to evaluate the practice of caesarean section in the study centre, as well as assess the morbidity suffered by the mothers and the state of health of the new-born infants. Knowledge of these outcomes would help in the review of the practice of caesarean section to ensure an improved and satisfactory maternity experience in the study centre.

MATERIALS AND METHODS

This was a prospective study of mothers who delivered in the Maternity unit of the University of Uyo Teaching Hospital for four consecutive months from 1st March 2017 to 30th June 2017. Approval to conduct the study was obtained from the Ethical Committee of the University of Uyo Teaching Hospital.

The University of Uyo Teaching Hospital is located in Uyo, the state capital of Akwa Ibom State, which is situated in the South-South geopolitical zone of Nigeria. The inhabitants of Uyo are mainly the Ibibios, the Annangs and the

Oro people of the state. There are a minority of other Nigerian tribes like the Efiks, the Igbos, the Yorubas and the Hausas. Most inhabitants of Uyo are business people, public servants and professionals. Other inhabitants are artisans, traders, farmers, students and the unemployed. Adverse neonatal outcome was defined as Apgar scores of 3 or less at 5 minutes of birth. The surgical site condition was adjudged to be satisfactory when the wound was healthy, well-apposed and dry on the 7th postoperative day.

Every mother scheduled for caesarean section in the labour ward was recruited into the study. Informed consent was obtained from each of them. A pro forma specially designed for the purpose of this study was utilized. The delivery register and clinical folders of the mothers were accessed and relevant information retrieved and recorded in the pro forma for each mother. Information obtained included demographic characteristics, obstetric parameters, antenatal records, labour and delivery details, indications for caesarean section, the operation notes, the state of health of the new-born on delivery, as well as the state of the operation site on the fourth and seventh postoperative day.

Data obtained are expressed in Arabic numerals, simple proportions and percentages. Most of the results are presented in tabular form. Data obtained were analysed with descriptive and inferential statistics. Chi-square test was used to assess for statistical significance in the differences in neonatal outcome and surgical site infection state between mothers with different demographic characteristics and obstetric parameters. A p-value of less than 0.05 was considered statistically significant.

RESULTS

During the four months period of the study, a total of 456 women were delivered in the maternity unit of the study centre, out of which 204(44.7%) women had spontaneous vertex delivery. Operative vaginal deliveries, namely vacuum and forceps extraction accounted for 1.5% and 0.7% respectively. The caesarean section rate in the centre during the period of the study was 53.1%.

Table 1 shows the socio-demographic characteristics of mothers. Most (93.4 %) of the mothers had minimum of secondary level of education, were married (99.4%), with the

majority (89.9%) in the peak reproductive age group of 21-35 years. The mean age of the women in the study was 29.40 + 4.44 years. A vast majority of the women were booked (86.2%), multiparous (56.8), with the majority (87.3%) having no history of voluntary induced abortion. The mean gestational age of mothers in the study was 37.69 + 4.53 weeks.

The practice of caesarean section in the unit during the period of the study is shown in Table 2. The majority (75.2%) of the caesarean sections were performed as emergencies with major indications being intra-partum haemorrhage (10.3%) and obstructed labour (9.5%), whereas two previous caesarean sections accounted for over half (59.5%) of all caesarean sections performed during the study period. Senior Registrars performed the majority (73.5%) of the caesarean sections and neonatal outcome for all deliveries were satisfactory in 88.8% of cases.

Table 3 shows the condition of the surgical site during the one week postoperative period; the site was satisfactory in 93.2% of cases on the 4th postoperative day, but this reduced to 89.9% by the 7th postoperative day. Wound break down occurred in one of the mothers.

Association between characteristics of the practice of caesarean section and neonatal outcome is demonstrated in Table 4. There was a highly statistically significant association between booked status of the mothers, elective caesarean section, use of subarachnoid anaesthesia and favourable neonatal outcome ($p < 0.005$).

Table 5 shows the association between characteristics of the practice of caesarean section and surgical site infection status on postoperative day 7. There was no statistically significant association between the majority of the characteristics and infection status of the surgical site ($p > 0.05$). However, booked status of the mothers and use of transverse skin incision were significantly associated with satisfactory state of the surgical site at the point of discharge from the unit on the 7th postoperative day ($p < 0.05$).

Table 1: Socio-Demographic parameters of mothers in the study population

Parameters	Frequency	Percentage (%)
Age groups (in years)		
< 20	10	2.2
21-25	71	15.6
26-30	207	45.4
31-35	132	28.9
36-40	32	7.0
> 40	4	0.9
Marital Status		
Married	453	99.4
Single	2	0.4
Divorced	1	0.2
Educational Level		
No formal education	3	0.7
Primary	27	5.9
Secondary	145	31.8
Post-secondary	281	61.6
Booking Status		
Booked	393	86.2
Un-booked	35	7.7
Referred	26	5.7
Defaulted	2	0.4
Parity		
0	16	3.5
1	162	35.5
2-4	259	56.8
5-7	19	4.2
Gestational age (in weeks)		
< 28	13	2.9
28-31.9	22	4.7
32-33.9	8	1.8
34- 36.9	31	6.8
37-42	382	83.8
History of induced abortions		
0	398	87.3
1	26	5.7
2-4	31	6.8
5	1	0.2
Total	456	100.0%

Table 2: Practice of caesarean section in the unit

Parameters	Frequency	Percentage
Timing of caesarean section		
Elective	60	24.8
Emergency	182	75.2
Indications for caesarean section		
Emergency		
Preeclampsia/eclampsia	6	2.5
Fetal distress	18	7.4
Failure to progress	17	7.0
Obstructed labour	23	9.5
Intrapartum haemorrhage	25	10.3
Elective		
Breech presentation	7	3.0
Transverse lie	2	0.8
2 Previous caesarean section	144	59.5
Surgeons rank		
Consultant	22	9.1
Senior registrar	178	73.5
Registrar	42	17.4
Type of anaesthesia		
GA	12	5.0
SAB	230	95.0
Type of incision used		
Midline	24	9.9
Pfannenstiel	218	90.1
Admin of intraoperative antibiotics		
Yes		
No	228	94.2
	14	5.8
*Any difficulty during surgery		
Yes	32	13.2
No	210	86.8
Skin closure technique		
Simple interrupted	12	4.9
Interrupted mattress	67	27.7
Subcuticular	163	67.4
Total	242	100.0%

*Refers to: extensive pelvic adhesions, delay in extraction of the fetus from the uterine cavity, problems with delivery of a morbidly adherent placenta, etc.

Table 3: Surgical site condition among mothers in the study centre

Surgical site findings	Frequency	Results
Post-operative day 4		
Satisfactory	220	93.2
Unsatisfactory	16	6.8
Postoperative day 7		
Satisfactory	214	89.9
Unsatisfactory	22	10.1
Total	236	100.0%
Grade of operation site infection		
Stitch abscess	5	22.7
Discharge from a part of the wound	10	45.5
Discharge from entire wound	6	27.3
Wound breakdown	1	4.5
Total	22	100.0%

^aUnsatisfactory condition of the surgical site refers to: serous, sero-sanguinous or purulent discharge, failure of complete apposition and poor healing of the incisional scar

Table 4: Association between characteristics of the practice of caesarean section in the unit and neonatal outcome

Variable	Neonatal Outcome Alive and well	Birth asphyxia or stillbirth	Total	Statistical test and values
Booking Status				
Booked	367 (93.4)	26 (6.6)	393	X ² = 69.37 p= 0.000 df= 3
Unbooked	18 (51.4)	17 (48.6)	35	
Referred	18 (69.2)	8 (30.8)	26	
Defaulted	1 (50.0)	1 (50.0)	2	
Timing of C-section				
Elective	58 (98.3)	1 (1.7)	59	X ² = 8.74 p= 0.001 F df= 1
Emergency	153 (83.7)	30 (16.3)	183	
Admin of intra-operative antibiotics				
Yes	202 (88.3)	27 (11.7)	229	X ² = 3.371 p= 0.086F df= 1
No	9 (71.2)	4 (28.6)	13	
Surgeons Rank				
Consultant	19 (86.4)	3 (13.6)	22	X ² = 1.416 p= 0.449 df= 2
Senior Registrar	154 (86.1)	25 (13.9)	179	
Registrar	38 (92.9)	3 (7.1)	41	
Type of Anaesthesia				
GA	4 (38.5)	8 (61.5)	12	X ² = 29.525 p= 0.000F df= 1
SAB	207 (90.0)	23 (10.0)	230	
Difficulty during surgery				
Yes	27 (84.8)	5 (15.2)	32	X ² = 0.197 p= 0.585F df= 1
No	184 (87.7)	26 (12.3)	210	
Incision Used				
Midline	17 (72.0)	7 (28.0)	24	X ² = 5.875 p= 0.025F df= 1
Transverse	194 (89.0)	24 (11.0)	218	
Parity				
1-4	389 (89.0)	48 (11.0)	437	X ² = 1.827 p= 0.255 df= 1
> 5	15 (78.9)	4 (21.1)	19	

Birth asphyxia refers to Apgar scores of 3 or less at 5 minutes of birth

Table 5: Association between characteristics of the practice of caesarean section and the surgical site condition on the postoperative day 7

Variable	7 th Day Post Op		Total	Statistical test and values
	Satisfactory	Unsatisfactory		
Booking Status				
Booked	189 (92.2)	16 (7.8)	205	$X^2 = 28.687$ p= 0.000LR* df= 3
Un-booked	12 (60.0)	8 (40.0)	20	
Referred	15 (94.1)	1 (5.9)	16	
Defaulted	0 (0.0)	1 (100.0)	1	
Timing of C-section				
Elective	54 (91.7)	5 (8.3)	59	$X^2 = 0.451$ p= 0.633F df= 1
Emergency	162 (88.6)	21 (11.4)	183	
Intra-operative antibiotics				
Yes	205 (89.6)	24 (10.4)	229	$X^2 = 0.206$ p= 0.650 df= 1
No	11 (85.7)	2 (14.3)	13	
Surgeons Rank				
Consultant	20 (90.9)	2 (9.1)	22	$X^2 = 0.794$ p= 0.652LR df= 2
Senior Registrar	158 (88.3)	21 (11.7)	179	
Registrar	38 (92.9)	3 (7.1)	41	
Type of Anaesthesia				
GA	8 (69.2)	4 (30.8)	12	$X^2 = 5.835$ p= 0.037F* df= 1
SAB	208 (90.5)	22 (9.5)	230	
Difficulty during surgery				
Yes	27 (84.8)	5 (15.2)	32	$X^2 = 0.810$ p= 0.366F df= 1
No	189 (90.0)	21 (10.0)	210	
Incision used				
Midline	17 (72.0)	7 (28.0)	24	$X^2 = 8.801$ p= 0.009F* df= 1
Transverse	199 (91.3)	19 (8.7)	218	
Parity				
1-4	210 (89.4)	25 (10.6)	235	$X^2 = 0.030$ p= 0.600F df= 1
> 5	6 (87.5)	1 (12.5)	7	

Unsatisfactory condition of the surgical site refers to: serous, sero-sanguinous or purulent discharge, failure of complete apposition or incomplete healing of the incisional scar

DISCUSSION

Caesarean section is an alternative route of childbirth, and it is associated with a surgical site on the anterior abdominal wall of the mother. The two major morbidities that might be associated with caesarean section are surgical site disruption and adverse neonatal outcome following the procedure.^{14,15,20} This study yielded a caesarean section rate of 53.1%, vacuum extraction rate of 1.5% and forceps delivery rate

of 0.7%. Considering the relatively short duration of the study, this statistics may not reflect the true rates of these procedures in the study centre. These rates therefore have limited application. The socio-demographic characteristics of mothers in the study population were similar to results from other centres in Nigeria, which confirm that most mothers receiving antenatal care in tertiary hospitals are young and married, with a minimum of secondary level of education.^{15,20}

The practice of caesarean section in the study centre revealed that the majority (73.5%) of sections were performed as emergency procedures by Senior registrars and this is in agreement with the pattern in other teaching hospitals in Nigeria.^{8,15} The setting in teaching hospitals in Nigeria is such that every Senior registrar in a specialist maternity unit has the prerequisite training, knowledge and surgical experience to perform emergency caesarean sections satisfactorily.⁸ Notwithstanding, such surgeries are performed under the Consultant's on call supervision.

Results show that surgical site infections occurred in 10.1% of the mothers who had caesarean sections, while wound breakdown occurred in one of the mothers. Conditions associated with unsatisfactory surgical site were failure to have booked for antenatal care in the study centre and failure to use a Pfannenstiel incision on the skin for the caesarean section.

While the timing of caesarean section with regard to whether it was elective or emergency, rank of the surgeon and difficulty at surgery did not influence the risk of surgical site infection in this study, other studies have found low level of education of mothers, prolonged operation time, rank of the surgeon and emergency caesarean sections to be associated with increased risk of surgical site infection.^{14,15,16,17} This discrepancy may result from the fact that there is a unit policy in the study centre whereby every mother who undergoes caesarean section in the study centre receives a standard dose of preoperative broad spectrum antibiotics intravenously on the operation table.

Favourable neonatal outcome was associated with booked status of mothers, elective caesarean section and use of subarachnoid anaesthesia during the surgery. This finding has identified these factors as potential protective factors from adverse neonatal outcome. However, it contrasted with results from other studies, which found adverse neonatal outcome in mothers who had caesarean section in association with short stature, postdate pregnancies, macrosomia, as well as in caesarean sections performed in the second stage of labour.^{18,19,20} Another study found adverse neonatal outcome to be associated with mothers who had publicly funded maternity care when compared to privately insured mothers.²¹ Adverse neonatal

outcome were associated with caesarean sections preceded by failed induction of labour, intramuscular administration of opioids intrapartum and prolonged labour in a study conducted in Australia.²² Interestingly, a study in India found adverse neonatal outcome among mothers who delivered earlier at term between 38 and 39 weeks of gestation, when compared with mothers who delivered after 39 weeks of gestation.²³ The protective role of antenatal care on mothers from adverse pregnancy outcome in this study has corroborated the submission of the National Demographic Health Survey, which states that the major objective of antenatal care is to ensure optimal health outcomes for the mother and her baby.²⁴

CONCLUSION

The majority of caesarean sections in the study centre during the period of the study were performed as emergencies by Senior Registrars. Adverse neonatal outcome were associated with un-booked status of the mothers and indications that warranted use of general anaesthesia. Unsatisfactory surgical site was associated with un-booked status of the mothers and use of midline incision. Post-caesarean section morbidity profile was due to unavoidable factors, as would be expected of a tertiary level health care institution with a high standard of practice. Additionally, antenatal care seems to have offered protection from adverse neonatal outcome and surgical site infection among mothers. This is another clarion call for all pregnant mothers to register and obtain antenatal care in accredited maternity centres.

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