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Original Research Article

Analysis of caesarean section at the University of Benin Teaching Hospital using Robson 10-group classification system: an observational retrospective study

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ABSTRACT

Background: Caesarean section (CS) refers to the delivery of the foetus, placenta, and membranes through an abdominal and uterine incision. In order to understand the factors responsible for rising CS rate and suggest effective measures to reduce CS rate, it is necessary to have a tool to monitor and compare CS rate in the same setting, over time and between different settings. It has been shown that women-based classification in general and the 10-group classification in particular were best to fulfil current international and local needs. This study aimed to analyse Caesarean sections at the University of Benin Teaching Hospital over one year using the Robson 10 group classification system.
Methods: This is an observational retrospective study at the University of Benin Teaching Hospital (UBTH), Benin City, Edo State, Nigeria. All women who gave birth at UBTH from January 1st 2020, to December 31st 2020, were studied. Data were collected using a proforma, chi-square analysis was done, and a p-value less than 0.05 was considered statistically significant.
Results: The Caesarean section rate during the study period of this was 45.8%. Using the Robson classification system, the highest group of women that delivered during the period was group 3 (multiparous (excluding previous CS), single cephalic, ≥/37weeks in spontaneous labour), followed by Group 5 (all multiparous with at least 1 previous CS, single cephallic, ≥/37weeks) and Group 4 (multiparous, excluding previous CS), single cephallic, ≥/37weeks, induced or pre labour CS). The highest contributing group to CS rate was Group 5, followed by Group 2 (nulliparous, single cephallic, ≥/37weeks, induced or pre labour CS), Group 10 (all women with a single cephallic pregnancy, <37 weeks, including women with previous CS(s)) and Group 4. Groups 8 (all women with multiple pregnancies, including women with previous CS(s)),10 and 7 (all multiparous women with a singleton breech pregnancy, including women with previous CS(s)) had the highest contribution to stillbirth and babies with 5th minute APGAR less than 7.
Conclusions: The study revealed a high CS rate in UBTH, with Robson Groups 5,10 and 2 accounting for a large percent of the CS rate during the study period. Effort should be targeted at reducing primary CS rate by reducing the incidence of failed IOL in nulliparous to the barest minimum, appropriate monitoring of labour to reduce the incidence of positional CPD, increased utilization of alternative to CS section, such as instrumental delivery and external cephalic version when they are indicated. The trend of increasing utilization of CS for indications that is not purely obstetric, such as maternal request, should be discouraged.

Keywords: Robson classification, Caesarean section rate, Obstetric outcomes, Labour monitoring, Maternal and perinatal outcomes

INTRODUCTION

Caesarean section (CS) refers to the delivery of the foetus, placenta, and membranes through an abdominal and uterine incision.[1] It is one of the most commonly performed surgical procedures in obstetrics and one of the oldest operations in obstetrics.[2] The procedure is performed when an obstetric condition precludes vaginal delivery.[3] CS rate is widely considered an important indicator for measuring access to obstetric services.[3,4] Ensuring access to CS is an essential strategy to reduce maternal and perinatal mortality.[4,5] so as to achieve the target of Sustainable Development Goal 3.1, which is reducing the number of maternal deaths to less than 70 per 100,000 live births by 2030.[6]

CS as a surgical procedure is associated with increased risk of maternal morbidity, including postpartum haemorrhage, blood transfusion, hysterectomy and even death, while a uterine scar can increase the risk of uterine rupture, placenta previa or morbidly adherent placenta in subsequent pregnancies.[3,7] These risks are more evident in areas with a paucity of skilled manpower and equipment for safe surgeries or management of complications. When compared with vaginal delivery, CS requires more health personnel and a higher cost both for the hospital, society and nation at large.[3-8]

In the past 5 decades, the rate of CS has steadily increased from 5% to over 30% in some areas.[1-9] In 2015, the World Health Organization (WHO) confirmed that at a population level, CS rates higher than 10% to15% are not associated with reductions in maternal and newborn mortality rates but acknowledged that the effects of CS rates on other outcomes (maternal and perinatal morbidity, paediatric outcomes, and psychological or social well-being) are still unclear and require further research.[10] The increase in CS deliveries is being seen across high, middle and low-income countries.[11] However, the increase has not been equally distributed across income or residency strata; in low-income countries, inequalities are exacerbated by the unnecessary overuse of CS in or among some facilities, settings or patient groups alongside others where the lack of access to the procedure leads to high levels of maternal and perinatal mortality.[12]

The reasons for increasing CS rate can be associated with improved obstetric care, which has led to increasing early detection of cephalopevic disproportion, foetal distress, abnormal lie and presentation, placenta previa and higher order multiparity. Others are women having their first birth at a later age, increased use of fertility treatment and overdiagnosis of foetal and maternal risk.[13,14] The increasing rate of primary CS has also led to an increase in the number of repeat CS. Improved safety of the procedure and better education and enlightenment of pregnant women have led to increasing use of CS for social indications such as maternal request.[1] Understanding the CS rate is challenging because many factors contribute to the overall rate.[13] In order to understand the factors responsible for rising CS rate and suggest effective measures to reduce CS rate, it is necessary to have a tool to monitor and compare CS rate in the same setting, over time and between different settings. Previous studies on CS rates have largely looked at the overall percentages of delivery by CS.[15] Variations in this overall CS rate between different settings over time are difficult to interpret and compare because of intrinsic differences in hospital factors and infrastructure (e.g. primary versus tertiary level), differences in the characteristics of the obstetric population served (e.g. percentage of women with previous CS) and differences in clinical management protocols (e.g. condition for induction or pre-labour CS). Ideally, there should be a classification system to monitor and compare CS rates in a standardized, reliable, consistent, and action-oriented manner. This classification system should be applicable internationally and useful for clinicians, facility administrators, public health authorities and women themselves. The lack of such an internationally recognized classification system has helped to fuel controversies and to maintain common myths about the causes of increasing CS rates, as well as potential risk and benefits of increasing CS rate.[15]

Different authors have developed and proposed several types of CS classification systems for use at the facility level for different purposes, with the overall aim of providing a consistent and standardized framework to look at caesarean section. A 2011 review of 27 different systems of classification of CS concluded that women-based classification in general and the 10-group classification in particular, was able to fulfil current international and local needs.[11-16] The 10-group classification system, also known as the Robson classification, was created to prospectively identify well-defined, clinically relevant groups of women admitted for delivery and to investigate differences in CS rates within these homogeneous groups of women.[13] Unlike a classification based on indications for CS, the Robson classification is for all women who deliver at a specific setting and not only for women who deliver by CS.[15-17] It is a complete perinatal classification. This system classifies all women admitted for delivery into one of 10 groups that are mutually exclusive and totally inclusive.[17,18] This means that based on a few basic obstetric variables, every woman admitted to deliver in a facility can be classified into one and only one of the 10 groups, and no woman will be left off the classification. These obstetric variables include parity, gestational age, foetal presentation, onset of labour, number of foetuses and history of previous CS.[18,19]

The WHO expect that the use of Robson classification will help health care facilities to: identify and analyse groups of women who contribute most and least to CS rate, compare practice in these groups of women with other units with more desirable results and consider change in practice. It will also help assess the effectiveness of strategies or interventions targeted at optimizing the use of CS, assess the quality of care and clinical management

practices by analysing outcomes by groups of women. It also assesses the quality of the data collected and raises staff awareness about the importance of this data, interpretation and use.[15-17] The table below shows the 10 groups of the Robson classification.

Robson 10-group classification.

Group	Description
1	Nulliparous, singleton cephallic, >/37weeks in spontaneous labour
2	Nulliparous, singleton cephallic, >/37weeks, induced or pre labour cs
3	Multiparous (excluding previous cs), singleton cephallic, >/37weeks in spontaneous labour
4	Multiparous(excluding previous cs), singleton cephallic, >/37weeks, induced or pre labour CS
5	All multiparous with at least 1 previous CS, singleton cephallic, >/37weeks
6	All nulliparous women with a singleton breech pregnancy
7	All multiparous women with a singleton breech pregnancy including women with previous CS(s)
8	All women with multiple pregnancies including women with previous CS(s)
9	All women with a singleton pregnancy in transverse or oblique lie, including women with previous CS(s)
10	All women with a singleton cephallic pregnancy,<37 weeks including women with previous CS(s)

General aim

This study aimed to investigate CS rate at the University of Benin Teaching Hospital, a tertiary health facility in Benin city, Edo state, Nigeria, and make analysis based on Robson 10 group classification system.

Objectives

The specific objectives were to determine the Caesarean section rate at the University of Benin Teaching Hospital over one year; to determine the contributions of Robson's 10 group classification to the CS rate at the University of Benin Teaching Hospital over the study period; to compare findings in 1 and 2 at the University of Benin Teaching Hospital; to suggest ways of improving the deployment of CS to improve maternal and perinatal health at the University of Benin Teaching Hospital.

METHODS

This was a retrospective study carried out at the University of Benin Teaching Hospital (UBTH), Benin city, Edo state, Nigeria. All women who gave birth at UBTH from January 1 2020, to December 31 2020, were studied.

Setting

University of Benin Teaching Hospital is a federal tertiary hospital located in Benin City, Edo State. The hospital serves as a major referral centre for Edo, Delta, Ondo and Kogi states. Patients are usually referred from General Hospitals, government-owned health centres, private medical centres and from other departments in the hospital. Doctors within and outside the hospital refer pregnant women for antenatal care and delivery. Emergency admissions of unbooked cases are made through the Emergency unit of the department. The Obstetrics and Gynaecology Department has 84 obstetric beds and undertakes about 2,500 deliveries annually. The average annual rate of CS in UBTH has been put at 33.4%.[20] The department has 2 obstetric theatres and 2 gynaecology theatre suites located close to the Labour Ward with its own theatre staff. CS are carried out by Resident Doctors and Consultants in the department with support from others like Anaesthetists, paediatricians, midwives and theatre staff. The department had 16 Consultants and 29 Resident Doctors during the study period.

Variables and data collection

The data was collected retrospectively from Quality of Care Analysis (QCA) form routinely filled for women who deliver in the department of Obstetrics and Gynaecology, UBTH and also patient case notes and Hospital Registers (Labour Ward, Maternity Ward and Operating theatre).Data collected for each woman who gave birth in the hospital during the study period include: maternal age, obstetric history (parity, previous CS), foetal presentation, gestational age (using the date of last menstrual period or early ultrasound scan), onset of labour (spontaneous, induced or pre-labour CS), number of foetuses, and birth weight. For vaginal deliveries, data were collected on whether it was a spontaneous vaginal delivery or an operative vaginal delivery. Data was also collected on the immediate postpartum condition of the mother, maternal complications and 1- and 5-minute APGAR scores of the neonate. Where the dating of pregnancy was difficult to assess, birth weight of greater than or equal to 2500g was used as a proxy for gestational age greater than or equal to 37 weeks.[15] The exclusion criteria were birth weight less than 500g or gestational age (GA) <24 weeks, and deliveries not conducted at UBTH (i.e. birth before arrival).

RESULTS

Table 1 and 2 shows that the mean age of women that delivered during this period was 31.6±5.2years with 75.6% being within age 20 to 35 years and the percentage of teenage pregnancy being 1.1% of the study population. Majority of the study population where multiparous who

delivered at term and had spontaneous onset of labour. Majority of the patients (82.2%) were booked and only 1% of deliveries conducted in the period under review were by instrumental delivery.

Others

Table 3 showed that the commonest indication during the study period was cephalopelvic disproportion (18.1%) followed by 2 or more previous CS (16.2%) and hypertensive disorders of pregnancy (13.5%). Also of note is that 3.4% of the CS done during the study period was for maternal request. Significant intrapartum bleeding, PMTCT, cord prolapse, IUGR, previous myomectomy, congenital anomaly, previous 3rd degree perineal tear, chorioamionitis, lower segment fibroid, previous vaginoplasty, preterm twin, retained 2nd twin, pubic symphyseal diastasis, previous hip replacement, cervical dystocia, antepartum haemorrhage? Cause.

Table 1: Socio-demographic and past obstetric characteristics (n=2166).

Variables	Frequency	Percentage (%)
Age (years)		
<20	23	1.1
20-35	1,638	75.6
>35	505	23.3
Mean age=31.59±5.213		
Parity		
Nulliparous	677	31.3
Multiparous	1,489	68.7
Booking status		
Booked	1,781	82.2
Unbooked	385	17.8
Previous C/S		
None	1,663	76.8
1	339	15.7
2	140	6.5
>2	24	1.1

Table 2: Obstetric characteristics.

Variables	Frequency	Percentage (%)
Type of gestation (n=2166)		
Single	2,101	97.0
Twin	60	2.8
Higher order multiple	5	0.2
Gestational age (n=2166)		
Term	1,823	84.2
Pre term	343	15.8
Onset of labour (n=2166)		
Spontaneous	1,034	47.7
Induced	535	24.7
Prelabour C/S	597	27.6
Presentation (n=2166)		
Cephalic	2,006	92.6
Breech	115	1.7
Shoulder	45	0.4
Delivery (n=2166)		
Spontaneous vaginal delivery	1151	53.1
Instrumental vaginal delivery	22	1.0
Caesarean section	993	45.8
5th min APGAR score (n=2238)		
<7	202	9.0
≥7	2,036	91.0
Foetal status (n=2238)		
Alive	2,122	94.8
Dead	116	5.2

Table 3: Distribution of the indiactions for caeserean sections (n=993).

Indications	Frequency	Percentage (%)
Cephalopelvic disproportion	180	18.1
2 or moreprevious CS	164	16.5
Hypertensive disorders	134	13.5
Foetal distress	127	12.8
Malpresentation/abnormal lie	103	10.4
Obstructed labour	48	4.8
Suspected foetal macrosomia	43	4.3
Placenta previa	42	4.2
Maternal request	34	3.4
Precious baby	30	3.0
Abruptio placentae	26	2.6
Others	62	6.2

Table 4: Robson reporting table and neonatal outcome by group.

Group	No of CS in group	No of women in group	Group size (%)	Group CS rate (%)	Absolute group contribution to overall CS rate(%)	Relative group contribution to overall CS rate(%)	Stillbirth (no of stillbirth/n of women (%)	Apgar <7 at 5 min (n of live birth APGAR <7/ n of women(%)
1	84	273	12.6	30.8	3.9	8.5	12 (4.4)	18 (6.6)
2	138	260	12.0	53.1	6.4	14.0	3 (1.2)	8 (3.1)
3	65	483	22.3	13.5	3.0	6.5	10 (2.1)	18 (3.7)
4	111	276	12.7	40.2	5.1	11.2	11 (4.0)	13 (4.7)
5	318	411	19.0	77.4	14.7	32.0	8 (1.9)	17 (4.1)
6	24	32	1.5	75.0	1.1	2.4	4 (12.5)	7 (21.9)
7	50	66	3.0	75.8	2.3	5.0	11 (16.7)	19 (28.8)
8	44	65	3.0	67.7	2.0	4.4	12 (18.5)	22 (33.8)
9	43	43	2.0	100	2.0	4.3	2 (4.7)	2 (4.7)
10	116	257	11.9	45.1	5.4	11.7	43 (16.7)	78 (30.4)
Total	993	2166	100	45.8	45.8	100	116 (5.4)	202 (9.3)

Table 5: The Robson classification table showing only the subdivision in groups 2,4 and 5 at UBTH.

Group	N CS in group	N of women in group	Group size (%)	Group CS rate (%)	Absolute group contribution To CS rate (%)	Relative group contribution to CS rate (%)
2A nullipaous single cephalic, term, induced	77	199	9.2	38.7	3.6	7.8
2B nulliparous single, cephalic, term, PLCS	61	61	2.8	100.0	2.8	6.1
4A multiparous(excluding prev c/s), single cephalic, term,induced	30	195	9.0	15.3	1.4	3.0
4B multiparous(excluding prev c/s), single cephalic, term, PLCS	81	81	3.7	100.0	3.7	8.2
5.1 one prev c/s single cephalic, term	182	273	12.6	66.7	8.4	18.3
5.2 two or more prev c/s, single cephalic, term	136	138	6.4	98.6	6.3	13.7

Table 6: Contribution to CS rate in group based on booking status.

Robson group	Booked			Unbooked		
	Frequency (%)	Number of CS	CS rate (%)	Frequency (%)	Number of CS	CS rate
1	229 (12.9)	50	21.9	45 (11.7)	35	77.8
2	236 (13.3)	118	50	24 (6.2)	20	83.3
3	439 (24.6)	38	8.7	44 (11.4)	27	61.4
4	246 (13.8)	89	36.2	30 (7.8)	22	73.3
5	383 (21.5)	293	76.5	27 (7.0)	24	88.9
6	15 (0.8)	15	100	17 (4.0)	9	52.9
7	41 (2.3)	34	82.9	25 (6.5)	16	64.0
8	37 (2.1)	30	81.1	28 (7.3)	14	50.0
9	31 (1.7)	31	100	12 (3.1)	12	100
10	124 (7.0)	57	46.0	133 (34.5)	59	44.4
Total	1781 (100)	755	42.3	385 (100)	238	61.8

Table 7: Distribution of severe neonatal outcomes by Robson group classification.

Group	No of severe neonatal outcome/no of women in group	Proportion of severe neonatal outcomes (SNO)	Proportion of SNO in SVD/total SVD	Proportion of SNO in IVD/ IVD	Proportion of SNO in CS/total CS
1	18/273	6.6	3/179 (1.7)	0/10 (0.0)	15/84 (17.9)
2	8/260	3.1	6/117 (5.1)	1/5 (20)	1/138 (0.7)
3	18/483	3.7	7/416 (1.7)	0/2 (0.0)	11/65 (16.9)
4	13/276	4.7	7/163 (4.3)	1/2 (50.0)	5/111 (5.6)
5	17/411	4.1	3/92 (3.3)	0/1 (0.0)	14/318 (4.4)
6	7/32	17.1	5/8 (62.5)	0/0 (0.0)	2/24 (8.3)
7	17/66	25.8	13/16 (81.3)	0/0 (0.0)	6/50 (12.0)
8	22/65	33.8	15/20 (75.0)	0/1 (0.0)	7/44 (15.9)
9	2/43	4.7	0/0 (0.0)	0/0 (0.0)	2/43 (4.7)
10	78/257	17.2	58/140 (41.4)	0/1 (0.0)	20/116 (17.2)
Total	202/2166	9.3	117/1151 (10.1)	2/22 (9.1)	83/993 (8.4)

From the Robson reporting table (Table 4), the highest group of women that delivered during the period was group 3 (multiparous (excluding previous CS), single cephalic, >/37weeks in spontaneous labour), followed by Group 5 (all multiparous with at least 1 previous CS, single cephallic, >/37 weeks) and Group 4 (multiparous (excluding previous CS), single cephallic, >/37weeks, induced or pre labour CS). Highest contributing group to CS rate was Group 5 followed by Group 2 (nulliparous, single cephallic, >/37weeks, induced or pre labour CS) Group 10 (all women with a single cephallic pregnancy, <37 weeks including women with previous CS and Group 4. Groups 8,10 and 7 had the highest contribution to stillbirth and babies with 5th minute APGAR less than 7.

Table 5 shows that Group 2A contributed most to the CS rate in Group 2 while Group 4B contributed most to the CS rate in Group 4. More of the CS in Group 5 where due to those with 1 previous CS.

Table 6 shows that CS rate among booked patient was 42.3% while that of unbooked patients was 61.8%.

Table 7 shows that severe neonatal outcome was worse in Group 8,7,10 and 6 and the severe neonatal outcome in these Groups were worse among those who had vaginal delivery compared to Caesarean section.

DISCUSSION

The number of women who delivered in UBTH from January 1 to December 31 2020, was 2166. The mean age of women who delivered during this period was 31.6±5.2 years. This was similar to findings in a study done in Bayelsa state Nigeria.[21] Of these deliveries, 1.1% occurred among women in their teenage years.

The CS rate during the period of this study was 45.8%. This was far higher than recommended by WHO and figures reported by previous studies done in UBTH.[10,20,22] This rise in CS is similar to trends seen in other studies.[3,9,11] Our hospital is a tertiary care hospital with referrals from other less equipped hospitals, so our high CS rate may not represent the rate in the general population, which has been put at 2.7%, but that of a tertiary care hospital.[23] The rate

is similar to a report from the University College Hospital, Ibadan and a tertiary hospital in Tanzania.[3-24]

When CS was analysed based on their indications, Cephalopelvic disproportion (CPD) was the commonest indication for CS, followed by 2 or more previous CS, and the third commonest indication was hypertensive disorders. This was similar to a previous study in this facility.[22] Of the patients who had CS for CPD, 36.7% were due to positional CPD. Proper monitoring of patients in labour and institution of timely use of appropriate interventions, such as oxytocin augmentation, will likely reduce CS due to this factor. Also of note is the occurrence of previously not common indications such as maternal request and precious baby (following IVF or prolonged infertility), which accounted for 3.4% and 3.0% percent of CS, respectively. Such indications were not noted in the previous review of CS in this facility.[22] This trend contributes to the increased CS rate noted and may be due to increased safety of the procedure, increasing enlightenment of women and increasing use of artificial reproductive technology in this facility.

From the Robson reporting table, the Groups that contributed the highest to the delivery during this period were Groups 3,5 and 4. These 3 groups accounted for 54% of the parturients in this period. This is explained by the fact that the majority of the study population are multiparous (68.7%), which is the usual pattern in developing countries. Also, the high rate of delivery in Group 5 indicates a high rate of CS in the past, especially in Groups 1 and 2.[15] This underscores the effect of primary Caesarean section on the overall Caesarean section rate in a population. The high rate of CS in Groups 2 and 1, which represent the 2 and 5 highest contributors to CS in the study, suggests that the trend of increasing CS rate may not decrease in the near future, as they represent the contribution to primary CS.

The main contributors to increased Caesarean section were Group 5 followed by Group 2 and Group 10. This was similar to findings in a tertiary health facility in Islamabad.[11] These 3 groups accounted for 57.5% of the CS in the study period. Subdivision of group 5 showed that those with one previous CS with a single cephalic foetus at term contributed more to the CS rate in Group 5 compared to those with 2 or more CS at term with a single cephalic foetus. This further highlights the importance of reducing the rate of primary CS as much as possible. Appropriate selection of patients for vaginal birth after CS will go a long way in reducing CS rate in this group. Subclassification of Group 2 and Group 4 (Table 4) showed that the CS rate was higher in Group 2A than in Group 2B. This indicates that a major contributing factor to CS rate is the failed induction of labour in nulliparous women. This is in contrast with the multiparous Group, where CS rate in group 4A was low compared to group 4B, indicating a higher success rate of induction of labour in multiparous compared to nulliparous parturients. Efforts should be targeted at improving the success rate of induction in nulliparous patients. This would include shrewd assessment for induction of labour (IOL), considering the cervical condition, waiting for natural labour to begin where possible, cervical ripening with appropriate methods and deferring IOL if cervical parameters are not favourable.

High rate of CS in Group 10 may be explained by the fact that this facility is a referral centre and many parturients at risk of preterm delivery are referred with the baby in utero to access the neonatal facility. The commonest indication for CS in Group 10 was eclampsia/pre-eclampsia with an unfavourable cervix (60.22%). Other indications were foetal distress and antepartum haemorrhage, and these findings were similar to findings of Khan et al.[11] The Groups with the least contribution to the CS rate were Groups 6, 8 and 9, and they also had the smallest group size. Though the contribution of Group 6 and 7 (nullipara and multipara breech with single foetus) to the total CS rate was low, they still have a high group CS rate 75.0% and 75.8% respectively, and this may be due to the report of the term breech trial, which recommended CS as the best route of delivery for breech presenting foetus.[25] However use of external cephalic version in appropriately selected patients can reduce CS rate in this group.[25]

Severe neonatal outcome was worse in groups 8, 7, 10 and 6 (Table 6). The severe neonatal outcomes in these Groups were worse among those who had vaginal delivery compared to Caesarean section. These findings were similar to those by Tongon et al.[3] This suggests that appropriate utilisation of CS in these groups of patients may improve perinatal outcome.

CONCLUSION

The finding from this study indicates a high CS rate in UBTH, with Robson Groups 5,10 and 2 accounting for a large percent of the CS rate in the study period. Effort should be targeted at reducing primary CS rate by reducing the incidence of failed IOL in nulliparous to the barest minimum, appropriate monitoring of labour to reduce the incidence of positional CPD, increased utilization of alternative to CS section, such as instrumental delivery and external cephalic version when they are indicated. The trend of increasing utilization of CS for indications that is not purely obstetric, such as maternal request, should be discouraged.

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