Robson classification of caesarean births: implications for reducing caesarean section rate in a private tertiary hospital in Nigeria

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Abstract

Background: Caesarean section (CS) is a potentially lifesaving obstetric procedure. However, there are concerns about the rising CS rate in many countries of the world including Nigeria. The Ten-Group Robson classification system is presently recommended as an effective monitoring tool for comparing CS rates and identifying target groups for intervention aimed at reducing the rates. The aim of this study was to evaluate the cesarean section rate and the groups with the highest risk of CS at the Obstetric unit of Babcock University Teaching Hospital (BUTH), using the Robson classification system.

Methods:A cross-sectional study involving 447 women who had their deliveries at the obstetric unit of BUTH between August 2020 and February 2022. Relevant information was retrieved from the delivery records of the study participants. Data were analyzed using the IBM-SPSS Statistics for Windows version 23.0 (IBM Corp., Armonk, NY, USA).

Results: The overall caesarean section rate was 51.2%. Robson groups 2, 3, 5, and 10 had the largest contribution to CS rate accounting for 34.5%, 14.0%, 12.6%, and 10.0% of overall rate respectively. Maternal age greater than 30 years (AOR 2.1, CI 1.3-3.2; P=0.001) and non-cephalic presentation (AOR 19.7, CI 2.5-151.8; P= 0.004) increased the likelihood of caesarean delivery. However, gestational age between 37-40 weeks was associated with a 60% reduction in likelihood of caesarean births when compared with gestational age below 37 weeks (AOR 0.4, CI 0.2-0.8; P=0.008).

Conclusions: The caesarean section rate in BUTH is high and Robson groups 2, 3, 5, and 10 are the major contributors to this high rate. Interventions targeted at these groups will assist in reducing caesarean section rates in BUTH. The Robson classification system is useful in providing a benchmark for future comparison of caesarean section rates within and across different obstetric units and regions in Nigeria.

Background

Caesarean section (CS) is a potentially lifesaving obstetric procedure often performed when it is determined that vaginal delivery could be harmful to either mother or the baby [1,2]. It essentially involves delivering a foetus by making an incision on the mother's abdomen and the uterus after the age of viability [3].

A survey of 150 countries reported the average worldwide CS rate to be 18.6%, with range of 6% to 27.2% in the least and most developed countries respectively [4]. Among the regions of the world, Africa has the lowest rate (7.3%) while Latin America and Caribbean regions have the highest (40.5%) [4]. Caesarean section rate also varies from one hospital to the other within the same country [5]. In Nigeria, CS rates of 27.6% and 32.9% were reported in Enugu and Sagamu respectively [3,5].

There is a global concern about the rising CS rate and this is particularly dramatic in many middle- and high income countries, but at a lower degree in low income countries [4,6]. The factors responsible for the rising CS rates are still subject to debate. Factors such as fear of litigation, changing maternal

characteristics, use of electronic foetal monitoring and changing professional practice styles have been implicated by some authors [3,4,7]. Some other researchers have postulated that socio-cultural and economic factors as seen in many cases of non-medically indicated caesarean sections also propel the rise in CS rate [4,8]. The World Health Organization has suggested that a population-based CS rate higher than 10% is not associated with any additional benefit for mother and baby [9,10]. Reports from surveys indicate that CS rates in many obstetric units in Nigeria are higher than the WHO threshold, and have been rising over the past few decades [3,5]. Although CS is a safe procedure when done by trained medical personnel, the global increasing CS rate is a cause for concern. This is because Caesarean section may be associated with some maternal and neonatal complications affecting the index or future pregnancies [1,11]. Compared with vaginal delivery, the procedure is also associated with increased health care costs [4,11]. While it is desirable to reduce the rate of CS in our obstetric units, it should be borne in mind that ensuring access to medically justifiable CS is an essential strategy to reduce maternal and perinatal morbidity and mortality [11]. Hence, it is very important to study the characteristics of women receiving the procedure and whether the procedure is being done for justifiable reasons [12]. It is also important to examine the reasons for the CS trend in different settings and populations of women [13]. In order to achieve this, there is need for an internationally accepted classification system that will enable the analysis and comparison of CS rates at various settings in a consistent manner and transform this data into useful information [12,14]. The Ten-Group Robson classification system is presently recommended by the WHO and International Federation of Gynecology and Obstetrics (FIGO) as an effective monitoring tool for comparing CS rates within various obstetric units over time as well as between them [10,15]. This system uses some obstetric characteristics such as parity, gestational age, previous CS, labour onset (spontaneous or induced), presentation and number of foetuses (singleton or multiple) to classify women into ten groups [16] There is some evidence to suggest that the use of the Robson classification system for auditing CS in health care facilities may result in reduced CS rates [9].

There is sparse data on the use of the Robson's classification for CS in Nigeria, although reports from many tertiary health facilities in the country suggest that the CS rate is higher than the WHO recommendation. The aim of this study is to evaluate the caesarean rates and the groups with the highest risk of CS at the obstetric unit of Babcock University Teaching Hospital, using the Robson classification system.

Methods

This cross-sectional study was conducted in the obstetric and anaesthetic care units of Babcock University Teaching Hospital (BUTH), Ogun State Nigeria. BUTH is a faith based tertiary hospital which provides care for patients from Ogun and Lagos states in Nigeria. Obstetric care is provided by Consultant Obstetricians, resident doctors undergoing training in obstetrics and gynaecology, nurses and midwives. The hospital has fully functional theatre suites manned by consultant anaesthetists. BUTH also provides paediatric and blood transfusion services. The target population were women who had their deliveries in the obstetric unit of BUTH.

Sample size determination

The minimum sample size required for the study was determined using the Cochran formula [17]: ($n = Z^2 pq/d^2$). A survey in Sagamu (a town about 6km from the study site) reported a caesarean section rate of 32.9% [3]. The calculated sample size for the study was 340; however a sample of 447 women was used for the study.

Data collection

The case files of all the women who had their deliveries in the hospital between August 2020 and February 2022 were retrieved and relevant information extracted. A data capture sheet specifically designed for this study, was used to extract information on the maternal characteristics such as age, parity, gestational age, the clinical indications for surgery, fetal outcome (live or still birth), birth weight and APGAR scores of babies. The caesarean sections performed during the study period was classified using the Robson ten group classification system (Table 1). This classification is based on six major obstetric variables- onset of labour (spontaneous or induced), parity, gestational age (weeks), fetal presentation, number of fetuses, and previous caesarean delivery [16]. The Robson group for each caesarean section was recorded on the data capture sheet.

Table 1

Caesarean section groups according to Robson classification

Robson Group	Clinical characteristics
1	Nulliparous, single cephalic, ≥37 weeks, spontaneous labor
2	Nulliparous, single cephalic, ≥37 weeks, induced labour or caesarean section before labour
3	Multiparous without previous caesarean section, single, cephalic, ≥37 weeks, spontaneous labour
4	Multiparous without previous caesarean section, single, cephalic, ≥37 weeks, induced labour or caesarean section before labour
5	Multiparous with previous caesarean section, single, cephalic, ≥37 weeks
6	All nulliparous breeches
7	All multiparous breeches (including previous caesarean section)
8	All multiple pregnancies (including previous caesarean section)
9	All transverse or oblique lies (including previous caesarean section)
10	All preterm single cephalic, <37 weeks (including previous caesarean section)

Data analysis

Data were analyzed using the IBM-SPSS Statistics for Windows version 23.0 (IBM Corp., Armonk, NY, USA). Analysis of the caesarean sections in each Robson group was done to determine the contribution of each group to the total caesarean sections (the number of CS divided by the total number of women undergoing caesarean section) and group contribution to the overall CS rate (the number of CS divided by the total number of women giving birth) [12]. Continuous variables were summarized using descriptive statistics such as mean (standard deviation) and median (interquartile range) at 95% confidence interval. Categorical variables were summarized using frequencies and percentages. Bivariate analysis was performed using Pearson's Chi-square test to establish the association between maternal characteristics and mode of delivery. Logistic regression analysis was done to determine the factors that influenced the decision for caesarean births. P-value less than 0.05 was considered statistically significant.

Results

The median age of study participants was 31years, with interquartile range (IQR) of 7years. Two hundred and sixty women (58.2%) were aged 30 years and above. One hundred and fifty five women (34.7%) were nulliparous while 150 (33.6%) had parity of 2 and above. The median parity was 1 with IQR of 2. Majority (332;74.3%) were delivered at term. The median gestational age at delivery was 38 weeks with IQR of 2 weeks. Four hundred and twenty seven women (95.5%) had singleton pregnancies and cephalic presentation. Majority of the babies (290; 64.9%) had birth weights between 2.5kg -3.9kg. The mean (± S.D) birth weight was 3.1kg (± 0.7) while the median birth weight was 3.2kg. Most of the babies (420; 94%) had five minute Apgar Score of seven and above (Table 2).

Table 2
Characteristics of study participants

Variable	N	%
Maternal age (years)		
< 30	187	41.8
≥ 30	260	58.2
Parity		
0	155	34.7
1	142	31.8
≥ 2	150	33.6
Gestational age (weeks)		
< 37	85	19.0
37–40	332	74.3
> 40	30	6.7
Presentation		
Cephalic	427	95.5
Non Cephalic	20	4.5
Number of gestation		
Singleton	427	95.5
Multiple	20	4.5
Newborn Birth weight(kg)		
< 2.5	65	14.5
2.5–3.9	290	64.9
≥ 4.0	92	20.6
Five minute Apgar Score		
< 7	27	94.0
≥ 7	420	6.0

Table 3 depicts the contribution of each of the Robson obstetric groups to the overall caesarean section rates. Out of the total number of 447 deliveries during the study period, 229 women had caesarean section giving an overall caesarean section rate of 51.2%. Robson group 5 had the largest input to total

CS (34.5%) and the largest contribution to the overall caesarean section rate (17.7%) while Robson group 6 had the smallest input to total CS (2.2%) and smallest contribution to overall CS rate (1.1%). All the women in groups 6 and 9 had caesarean sections i.e. group specific CS rate of 100%. Women in group 3 had the smallest group specific CS rate (16.9%). The commonest indication for CS was previous caesarean section (87; 38.0%), followed by poor progress in labour (24; 10.5%) (Table 4).

Table 3
Contribution of Robson ten obstetric groups to the overall Caesarean section rate

Robson Group	Number of women (n1)	Relative size of Robson group (%) n1/N1	Number of CS (n2)	Group specific CS (%) n2/n1	Group input to total CS (%) n2/N2	Group input to overall CS rate (%) n2/N1
1	86	19.2	21	24.4	9.2	4.7
2	38	8.5	32	84.2	14.0	7.2
3	136	30.4	23	16.9	10.0	5.1
4	18	4.0	15	83.3	6.6	3.4
5	81	18.1	79	97.5	34.5	17.7
6	5	1.1	5	100.0	2.2	1.1
7	9	2.0	8	88.9	3.5	1.8
8	20	4.5	11	55.0	4.8	2.5
9	6	1.3	6	100.0	2.6	1.3
10	49	11.0	29	59.2	12.6	6.5
Total	447	100.0	229		100.0	51.3

CS = Caesarean Section; N1 = Total births (447); N2 = Total CS births (229); n1 = number of women in each Robson group; n2 = number of CS births in each Robson group

Table 4
Indications for caesarean section

Indication	Frequency	Percentage
Previous caesarean section	87	38.0
Poor progress in labour	24	10.5
Cephalopelvic disproportion/ Obstructed labour	21	9.2
Hypertensive disorders of pregnancy	19	8.3
Foetal distress in labour	17	7.4
Maternal request	12	5.2
Breech presentation	10	4.4
Other malpresentations / abnormal lie	7	3.1
Multiple pregnancy	5	2.2
Postdate /post term pregnancy	5	2.2
Antepartum hemorrhage	4	1.7
Preterm labour	3	1.3
Antepartum non-reassuring foetus	2	0.9
Others	13	5.7

The association between some maternal characteristics and mode of delivery is depicted in Table 5. Factors such as maternal age ($P < 0.001$), gestational age at delivery ($P = 0.035$), and presentation ($P < 0.001$) had a statistically significant association with mode of delivery. Logistic regression analysis was performed to determine whether maternal characteristics such as maternal age, parity, gestational age, presentation of foetus, number of gestation and birth weight influence decision for caesarean births. The model provided a statistically significant improvement over the constant-only model, ($\chi 2 = 46.66$, $p = 0.00$). The Nagelkerke R2 indicated that the model accounted for 13.2% of the total variance and the overall predictive accuracy was 61.1%. Results from the regression analysis suggest that maternal age, gestational age at delivery and presentation of foetus significantly influenced the mode of delivery. Women aged 30 years and above had twice the chance of having caesarean delivery than women aged less than 30 years (AOR 2.1, CI 1.3–3.2; $P = 0.001$). Similarly, non-cephalic foetal presentation increased the chance of caesarean delivery by almost 20 folds (AOR 19.7, CI 2.5-151.8; $P = 0.004$). However, gestational age between 37–40 weeks was associated with a 60% reduction in likelihood of caesarean births when compared with gestational age below 37 weeks (AOR 0.4, CI 0.2–0.8; $P = 0.008$) (Table 6).

Table 5
Association between maternal characteristics and mode of delivery

Variable	Caesarean section	Vaginal delivery	χ^2	P value
Maternal age (years)				
< 30	77(41.2)	110 (58.8)	13.007	< 0.001*
≥ 30	152 (58.5)	108 (41.5)		
Parity				
0	75(48.4)	80(51.6)	2.816	0.245
1	81(57.0)	61(43.0)		
≥ 2	73(48.7)	77(51.3)		
Gestational age (weeks)				
< 37	54(63.5)	31(36.5)	6.681	0.035*
37–40	159(47.9)	173(52.1)		
> 40	16(53.3)	14(46.7)		
Presentation				
Cephalic	210(49.2)	217(50.8)	16.054	< 0.001*
Non Cephalic	19(95.0)	1(5.0)		
Birth weight(kg)				
< 2.5	35(53.8)	30(46.2)	1.804	0.406
2.5–3.9	142(49.0)	148(51.0)		
≥ 4.0	52(56.5)	40(43.5)		
Number of gestation				
Singleton	218(51.1)	209(48.9)	0.119	0.821
Multiple	11(55.0)	9(45.0)		
One minute Apgar Score				
< 7	40(54.8)	33(45.2)	0.444	0.525
≥ 7	189(50.5)	185(49.5)		
Five minute Apgar Score				

*P < 0.05 statistical significant

Variable	Caesarean section	Vaginal delivery	χ^2	P value
< 7	15(55.6)	12(44.4)	0.215	0.695
≥ 7	214(51.0)	206(49.0)		
*P < 0.05 statistical significant				

Table 6
Determinants of caesarean births

Variable	Caesarean birth N = 229	Adjusted Odds ratio	95% Confidence Interval	p-value
Maternal age (years)				
< 30	77(41.2)	1		
≥ 30	152 (58.5)	2.1	1.3–3.2	0.001*
Parity				
0	75(48.4)	1		
1	81(57.0)	1.4	0.8–2.3	0.196
≥ 2	73(48.7)	0.7	0.4–1.2	0.214
Gestational age (weeks)				
< 37	54(63.5)	1		
37–40	159(47.9)	0.4	0.2–0.8	0.008*
> 40	16(53.3)	0.5	0.2–1.4	0.179
Presentation				
Cephalic	210(49.2)	1		
Non Cephalic	19(95.0)	19.7	2.5-151.8	0.004*
Birth weight(kg)				
< 2.5	35(53.8)	1		
2.5–3.9	142(49.0)	1.6	0.8–3.5	0.206
≥ 4.0	52(56.5)	2.4	1.0-5.8	0.045
Number of gestation				
Singleton	218(51.1)	1		
Multiple	11(55.0)	1.2	0.5–3.5	0.655
*P < 0.05 statistical significant				

Discussion

The overall caesarean section rate in this study was 51.2% with previous caesarean section being the commonest indication. Robson groups 2, 3, 5, and 10 had the highest contribution to caesarean delivery

in the hospital. The caesarean section rate of 51.2% is similar to findings from studies in a public tertiary hospitals in Lagos (51.3%) and Brazil (50.8%) [18, 19]. Other public tertiary hospitals in Nigeria, however, report varying CS rates such as 21.4% in Abuja [20], and 42.4% in Bayelsa [21]. Studies have suggested that caesarean section rates are often higher in private hospitals compared to public hospitals [12, 18]. There is a dearth of studies on the caesarean sections in private hospitals in Nigeria, however, studies from private facilities in Bangladesh and Brazil reported caesarean section rates of 73% and 87.9% respectively [12, 22]. It is believed that private health facilities allow more liberal use of caesarean sections for social reasons or maternal requests. Another possible reason is fear of litigation which is more likely in clients of private hospitals than public hospitals. This study was carried out in a tertiary hospital which receives referrals of complicated cases from peripheral health facilities. This may also have accounted for the high caesarean section rate. Nevertheless, the rising caesarean section rates in both developing and developed countries continue to be a serious cause for concern.

Robson groups 5(34.5%) and 2(14.0%) were the largest contributors to the total CS. A similar pattern was reported in a study done in Brazil [19]. The fact that Group 5 contributed about a third of all CS may be a reflection of low rates of vaginal births after CS (VBAC). The standard practice in many obstetrics units is to consider VBAC in women with one previous CS who have no contraindications and recommend elective repeat CS for those that have more than one previous CS or have contraindications to VBAC. Although this study did not enquire about the total number of women who planned or attempted VBAC, the high group specific CS rate (97.5%) in Robson group 5 suggests a very low VBAC rate. It is either that many women with previous CS are unwilling to undertake VBAC or they are not given enough support for the procedure due to fear of uterine rupture. One strategy that has been found to be successful in increasing VBAC rates is the setting up of dedicated VBAC clinics where women are adequately counselled and supported to make informed choices on the mode of birth for their next pregnancy [23]. Computer based decisions aids have also been employed to assist women in making decision on mode of delivery after a previous CS, with a resultant increase in VBAC rates [24].

Women in Robson group 2 made the second largest contribution to the total caesarean sections in this study. The group specific CS rate for group 2 is also high (84.2%), although comparable to findings from a similar study in Brazil (83.6%). It was however lower than reports from a private facility in Bangladesh (99%) [12, 22]. Women in this group are arguably low risk women, hence, the relatively high contribution to the total CS rate reflects either a low rate of planned induction or reduced success of induction of labour in this category of women. Hence, the appropriate use of induction of labour will also assist in reducing unnecessary caesarean sections.

The third group that contributed most to the CS rate in this study was the preterm birth group (Robson group 10), contributing to 12.6% of the total CSs performed and having a group specific CS rate of 59.2%. Robson group 10 was also the third largest contributor to CS rate in Brazil with a CS rate of 9.4% and group specific CS rate of 50.1% [22]. It is likely that the caesarean sections carried out for this group of women are medically justified, possibly to improve perinatal outcomes.

All women in groups 6 and 9 had caesarean births i.e. group specific CS rate of 100%. This is not unusual, as these were women who had either foetal malposition or abnormal lie. Similar findings were reported in Bangladesh and Brazil [12, 19]. It should be noted, however, that the combined relative size of these two groups was just 2.4% of total births, hence, their contribution to the total CS rate was minimal. The CS rates in Robson groups 1 and 3 are comparable, being 9.2% and 10% respectively. The indications for CS in these women are likely due to poor progress in labour or foetal distress in labour. The lower group specific CS rate in group 3 women (16.9%) compared to group 1 women (24.4%) is not unexpected since nulliparous women are more prone to labour dystocia than multiparous women [25].

The commonest indication for caesarean section in this study was previous caesarean section, making up 38% of all indications. This was followed by labour dystocia which accounted for almost 20% of the indications. Previous caesarean section was also the commonest indication in other similar studies, with reported rates of 32% in Lagos, 39% in Tanzania and 35% in Bangladesh [11, 12, 18].

Logistic regression analysis suggests that maternal age, gestational age at delivery and presentation of foetus significantly influenced the mode of delivery. Older women were found to have twice the chance of having caesarean delivery than younger women. This finding has been corroborated by other studies [2, 26, 27]. Older women may have other risks factors of adverse pregnancy outcomes such as hypertension and diabetes and this may increase their chance of caesarean delivery [26]. Moreover, many career women delay pregnancies till when they are at advanced age, some may have had history of infertility, and some may have conceived via In-Vitro Fertilization. All these factors may have contributed to the increased odds of caesarean delivery in older women. Women who delivered preterm had a higher likelihood of caesarean delivery than term pregnancies. The mode of delivery in these instances may be due to the associated maternal or foetal morbidities necessitating such preterm delivery or the inability of such foetuses to successfully go through the stress of labour. Non-cephalic foetal presentation increased the chance of caesarean delivery by almost 20 fold. This is not unexpected as malpresentations have been found to be the commonest reason why doctors may make the final decision for caesarean section [27].

One advantage of the Robson classification is that it helps to identify the target groups that may benefit from interventions aimed at reducing caesarean section rates [22]. The Robson groups 5, 2,10, and 3 contributed to over 70% of the caesarean sections in BUTH during the study period. The findings from this study suggest that efforts directed at reducing the first caesarean section and encouraging VBAC when indicated will have the most significant effect on reducing caesarean section rate. In the light of the recent evidence [28] which suggests that cervical dilatation threshold of 1cm/hour is unrealistic in most women irrespective of parity, obstetricians and midwives should be more circumspect before diagnosing poor progress in labour as this often results in unjustified primary caesarean sections. The appropriate use of, and effective protocol for induction of labour when indicated will also help to reduce caesarean section rate. Effective counselling of intending parturients, continuous labour support, pain management including clear agreement on availability of epidural analgesia and high level adherence to evidence-based clinical guidelines are some of the other measures that may encourage women to opt for vaginal

delivery and have a satisfactory experience in labour. The effective implementation of these strategies will ultimately lead to safe reduction in caesarean section rate [6].

This study represents to the best of our knowledge, the first documentation of the analysis of caesarean section using Robson classification in a private teaching hospital in Nigeria. The analysis of the relative contribution of each Robson group to the CS burden is also a strength of this study. This study however has some limitations that should be considered. Some of the stated indications for CS could not be validated since the data was collected retrospectively from case files. Also, considering the fact that the study was done in a single tertiary hospital with a significant burden of referred cases, some of the findings might not be generalizable. Nevertheless, this study highlights the need to target Robson groups 5, 2, 10, and 3 for specific interventions in order to reverse the rising trend of caesarean births in our environment.

Conclusions

The caesarean section rate in BUTH was 51.2%; Robson groups 2, 3, 5, and 10 were the major contributors to this high rate. Interventions targeted at these groups will assist in reducing caesarean section rates in BUTH. In addition to its usefulness in formulating strategies necessary to maintain an optimum CS rate, the Robson classification system will also provide a benchmark for future comparison of caesarean section rates within and across different obstetric units and regions in Nigeria.

Declarations

Ethics approval and consent to participate

The study was carried out in accordance with the Helsinki Declaration. Due to the retrospective nature of the study, the women whose data (extracted from case files) were used could not be accessed to provide informed consent. However, consent waiver and ethical approval for the study were obtained from the Babcock University Health Research Ethics Committee (BUHREC 754/21) prior to commencement of the study. It was also ensured that the dataset did not contain any direct or indirect person identifiers, and confidentiality was not compromised.

Ethical Consent for publication

Not applicable

Availability of data and materials

The datasets supporting the conclusions of this article are included within the article.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

AAA[1] conceptualised the study. AAA[1] and JOI designed the study. AAA[1], OFS, CCN and AAA[3] managed the literature search and gathered data. AAA[1] analysed the data and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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