Utilization of Robson 10-group caesarean section classification among midwives and obstetricians in Nyahururu County Referral Hospital, Kenya

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DOI: 10.29322/IJSRP.14.11.2024.p15504

Paper Received Date: 14th October 2024
Paper Acceptance Date: 26th November 2024
Paper Publication Date: 6th December 2024

***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 Kenya. 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 caesarean section rate and the groups with the highest risk of CS at Nyahururu County Teaching and Referral Hospital (NTRH), using the Robson classification system.

Methods: A cross-sectional study involving 800 women who gave birth at the obstetric unit of NRTH between April 2024 and June 2024. Retrospective study was utilized and relevant information was retrieved from the delivery records of the study participants. Data was analyzed using the IBM-SPSS Statistics for Windows version 27.0. Ethical approval was gained from relevant authorities and research ethics was observed throughout and after study period.

Results: The 2570 women gave birth to 2752 babies since some women had multiple pregnancies. The overall CS rate was 23.8% (95% CI: 22.4%–44.3%). The major contributors to the overall CS rates were: Robson group 5 (multiparous women with at least one previous CS) 7.8% and group 2 (Nulliparous, single cephalic, ≥37 weeks, induced labour or CS before labour) 6.8%, and group 4 (Multiparous without previous CS, single, cephalic, ≥37 weeks, induced labour or CS before labour) 4.8%. The most commonly reported indications for CS were 'fetal compromise' (29.3%) followed by previous CS (20.3%), prolonged labour (19.8%), obstructed labour (17.7%), multiple pregnancy (10.2%) and other indications like malposition and pre-eclampsia contributed 2.7%.

Conclusion: fetal distress was the main contributing risk for a CS indication, and many of them were in a low-risk group. Few had trial of labour in cases of borderline obstruction. More active use of partogram, improving fetal heartbeat-monitoring system, implementing midwife-led care to reduce high induction rate, and auditing the appropriateness of CS indications may help to reduce the CS rate

***Index Terms*-** Caesarean section, Robson classification, C-Section rates

I. Introduction

The Robson classification of caesarean section is a tool recommended by the World Health Organization (WHO) with an aim of identifying and analysing the groups of women which contribute most and least to overall CS rates [1]. The Robson classification is also known as 10-group classification. The system classifies all women into one of 10 categories that are mutually exclusive and, as a set, totally comprehensive. The categories are based on 5 basic obstetric characteristics that are routinely collected in all maternities (parity, number of foetuses, previous caesarean section, onset of labour, gestational age, and foetal presentation) [1].

Caesarean section (CS) or C-Section is a surgical procedure performed to facilitate delivery of the baby through an incision made on the mother's abdomen. Ideally, it is recommended in situations where normal vaginal delivery (VD) can pose risks to either the mother, baby, or both [2]. Over the years, global CS rates have significantly increased from around 7% in 1990 to 21% today surpassing the ideal acceptable CS rate which is around 10%–15% according to the WHO [3].

For many years, this surgical procedure has been done on account of these factors either scheduled or on emergency basis with proven advantages [4]. CS reduces both maternal and neonatal morbidity and mortality significantly when it is done under proper indications while at the same time, it can be of harm to the mother and the child when performed contrary. However, currently, not all CS are done for medical reasons with rapidly increasing rate of non-medically indicated CS and the so-called "C-Section on maternal request" [5,6].

According to a systematic review conducted by Betran et al., latest available data (2010–2018) from 154 countries covering 94.5% of world live births showed that 21.1% of women gave birth by caesarean worldwide, in average the caesarean section rate was ranging from 5% in sub-Saharan Africa to 42.8% in Latin America and the Caribbean. CS had risen in all regions since 1990 with projections showing that by 2030, 28.5% of women worldwide will give birth by CS (38 million caesareans of which 33.5 million in LMIC annually) [7].

In Kenya, a study on women's experience of unexpected caesarean section birth in Kitui County showed that births through C-Section have almost doubled in the past eight years, from nine percent in 2014 to 17 percent in 2022 [8]. A study on caesarean rates among selected hospitals in Nairobi Kenya showed that Private hospitals were at 44%, Mission/Private hospital at 25% and public hospital at 29% respectively, Emergency caesarean section accounted for 20% of the CS and elective caesarean sections accounted for 10% [9].

While it is desirable to reduce the rate of CS in Kenyan 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 [10]. Hence, it is very important to study the characteristics of women receiving the procedure and whether the procedure is being done for justifiable reasons [11]. It is also important to examine the reasons for the CS trend in different health facilities and population of women [12]. In order to achieve this, there is need for adoption and consistent use of an internationally accepted classification system that has been proven to enhance the analysis and comparison of CS rates at various settings in a consistent manner and transform this data into useful information [1].

A review of CS in Kenya using the classification system would be key in creating a consistent and more agreed methodological system for the tracking, auditing, and analysis of caesarean section rates since there is sparse data on the use of the Robson's classification for CS in Kenya, although reports from many tertiary health facilities in the country suggest that the CS rate is higher than the WHO recommendation set at 10-15% [2]. The aim of this study is to evaluate the caesarean rates and the groups with the highest risk of CS at the Nyahururu County Referral and Teaching Hospital, using the Robson classification system.

II. Methods

Study design

The study adopted an observational retrospective study design to examine the indications for caesarean sections conducted in Nyahururu County Teaching and referral hospital between April and September 2024.

Study setting

Nyahururu County referral and teaching Hospital is a level 5 hospital in Laikipia County, serving the community from both Laikipia county and Nyandarua county since its located at the border of the two counties. There are two operational theatre in the health facility and approximately 6000 births are attended annually. Obstetric care is provided by four (4) Consultant Obstetricians, complemented by fifty (20) medical doctors, eighty (80) nurses and thirty (30) midwives. On average 420±15 deliveries are conducted per month.

Sample size

The researcher examined all the files of the mothers who delivered in Nyahururu County referral and teaching hospital between April and September 2024 using census sampling method. There were 2570 women who had delivered in the facility whose files were extracted and used for the study. The study involved files of all mothers who delivered regardless of mode of delivery; either spontaneous vertex delivery (SVD) or caesarean section (CS). Later for the purpose of the study, the files whose mothers had undergone a caesarean section were used for the classification based on indication for the caesarean section.

Data collection

The case files of all the women included for the study were retrieved and relevant information extracted. A data capture sheet specifically designed for this study was used to extract information on the maternal characteristics including age, parity, gestational age, number of foetuses, foetal presentation, the clinical indications for surgery, induction of labour (Yes or No), type of CS (elective or emergency), foetal outcome (live or still birth), birth weight and Apgar scores of babies. The CSs performed during the study period were classified using the Robson ten group classification system with subdivisions [1] (Table 1). This classification was based on six major obstetric variables; onset of labour (spontaneous, induced, or pre-labour CS), parity (Nullipara or Multipara), gestational age (preterm or term), fetal presentation (cephalic presentation, breech presentation or transverse lie), number of fetuses (Singleton or Multiple), and previous caesarean delivery (Yes or no). The Robson group for each CS was recorded on the data capture sheet.

Table 1: Robson classification with subdivisions

Robson Group	Clinical characteristics of
1	Nulliparous, single cephalic, ≥37 weeks, spontaneous labor
2	Nulliparous, single cephalic, ≥37 weeks, induced labour or CS before labour
2a	Labour induced
2b	Pre-labour CS
3	Multiparous without previous CS, single, cephalic, ≥37 weeks, spontaneous labour
4	Multiparous without previous CS, single, cephalic, ≥37 weeks, induced labour or CS before labour
4a	Labour induced
4b	Pre-labour CS
5	Multiparous with previous CS, single, cephalic, ≥37 weeks
5.1	With one previous CS
5.2	With two or more CS
6	All nullparous breeches
7	All multiparous breeches (Including previous CS)
8	All multiple pregnancies (Including previous CS)
9	All transverse or oblique lies (including previous CS)
10	All preterm single cephalic, <37 weeks (Including previous CS)

Data analysis

Data was analyzed using the IBM-SPSS Statistics for Windows version 27.0 (IBM Corp., Armonk, NY, USA). Analysis of the CSs in each Robson group was conducted to determine the contribution of each group to the total CSs (the number of CS in index group divided by the total number of women undergoing CS) and group contribution to the overall CS rate (the number of CS in index group divided by the total number of women giving birth) [11]. The normality of distribution of continuous variables was tested by Kolmogorov-Smirnov test. Continuous variables like maternal age, gestational age at delivery, birth weight, and Apgar scores were summarized using median (Q1-Q3). Categorical variables were summarized using frequencies and percentages.

Ethical Considerations

The researcher sought approval to conduct the study from Jomo Kenyatta University of Agriculture and Technology institutional Ethics and Review Committee (IERC). On actual collection of data, authority to undertake the study was sought from the National Council of Science and Technology (NACOSTI). The researcher also sought permission to conduct the study from Nyandarua County Ministry of Health. Permission was sought from the local authorities (Chief Executive Officer, CEO) of the hospital before commencing the study. All the participants were informed of the research objectives, the study procedures, their rights and obligations, the expected benefits and the possible risks before signing an informed consent. The individual patient files were retrieved from the health records. In addition, confidentiality of information obtained during data collection was maintained and that it was used only for the purpose of the study. Unique codes were assigned to the questionnaires to ensure anonymity of the individual files during data collection. All ethical principles were followed during the research.

III. Results

Over the six-month period, a total of 2,570 women presented for labor and delivery. Twenty women had presented with intrauterine fetal death and twenty-five others had incomplete records; therefore, forty-five women were excluded. Thus, a total of 2525 deliveries were analyzed. The mean age of participants was 26.4 years (SD 4.7). The rate of CS was 23.8% (95% CI [22.4%-24.3%]). Summary of the social demographic characteristics of the women is presented in table 2. The study found that majority had basic formal education, rural dwellers and house wives.

Table 2: Social demographic characteristics of women who delivered at Nyahururu County Referral Hospital

Variables	Frequency	Percentage
Maternal age		
<20 years	101	4.2
20-29 years	1598	62.2
30- 39 years	646	25.5
40- 49 years	204	8.1
Residence of the mother		
Rural	1739	68.9
Urban	786	31.1
Occupation of the mother		
Housewife	1512	59.9
Casual worker	588	23.3
Business	310	12.3
Formal employment	115	4.5
Marital status		
Single	679	26.9
Married	1686	66.7
Divorced/ separated	160	6.4
Level of education		
Informal	89	3.7
Primary	286	11.3
Secondary	1628	64.4
Tertiary	522	20.6

The obstetric characteristics of the mothers was analyzed and it was found that 1063(42.1%) of the study participants were nulliparous. Majority of the participants had attended two ANC visit during this pregnancy. Of all births, 13.2% were preterm. CS was performed on 601 (23.8%) women, with 158 (26.2%) of them being elective caesarean sections. Summary of the results are shown in table 3. Out of all the mother included in the study, 182 (7.2%) were having multiple pregnancy with majority of the neonates weighing between 2500g to 3500g.

Table 3: Obstetric characteristics of women who delivered in Nyahururu Teaching and referral Hospital
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[1] **Variables**	[2] **Frequency**	[3] **Percentage**
[4] **Parity**		
[5] Nulliparous	[6] 1063	[7] 42.1
[8] Para 1-4	[9] 1419	[10] 56.2
[11] Para >4	[12] 43	[13] 1.7
[14] **ANC attended in this pregnancy**		
[15] 1	[16] 148	[17] 5.9
[18] 2	[19] 1560	[20] 61.8
[21] 3	[22] 817	[23] 32.3
[24] **Gestational age at birth**		
[25] Preterm (<37 weeks)	[26] 333	[27] 13.2
[28] Term (37-42 weeks)	[29] 2008	[30] 79.5
[31] Post term (>42 weeks)	[32] 184	[33] 7.3
[34] **Onset of labour**		
[35] Induced	[36] 249	[37] 9.9
[38] Spontaneous	[39] 2178	[40] 86.2
[41] Pre-labour CS	[42] 98	[43] 3.9
[44] **Fetal presentation/ lie**		
[45] Cephalic	[46] 2386	[47] 94.5
[48] Breech	[49] 91	[50] 3.6
[51] Transverse/ Oblique lie	[52] 48	[53] 1.9
[54] **Mode of delivery**		
[55] SVD	[56] 1924	[57] 76.2
[58] Emergency CS	[59] 503	[60] 19.9
[61] Elective CS	[62] 98	[63] 3.9
[64] **Number of fetuses**		
[65] Singleton	[66] 2343	[67] 92.8
[68] Multiple	[69] 182	[70] 7.2
[71] **Previous CS**		
[72] No	[73] 2038	[74] 80.7
[75] Yes	[76] 487	[77] 19.3
[78] **Birth weight of the newborn**		
[79] <2500g	[80] 282	[81] 11.2
[82] 2500g- 3500g	[83] 2125	[84] 84.1
[85] >3500g	[86] 118	[87] 4.7

SVD Spontaneous vertex delivery
CS Caesarean section

Robson´s 10-Group classification system

All the women who delivered at the Nyahururu Teaching and Referral Hospital (NTRH) were classified according to Robson´s 10-Group classification system and the study found that the overall CS rate was at 23.8%. the major contributors to the overall CS rate were: group 5 (multiparous women with at least one previous CS), group 2 (Nulliparous, single cephalic, ≥37 weeks, induced labour or CS before labour), and group 4 (Multiparous without previous CS, single, cephalic, ≥37 weeks, induced labour or CS before labour) as shown in table 4. All the women in group 9 (women with transverse or oblique lie) were delivered via CS except one woman whose trial of labour was successful and she delivered via SVD. The mother had delivered via breech, therefore, she was re-classified as breech. The data was validated using the Robson´s guidelines on data collection validation steps.

Table 4: Robson´s 10-Group classification system of women who delivered at NTRH

Robson Group	CS in group	Number in group	Group size (%)	CS in group (%)	Absolute contribution of the group to the overall CS rate (%)	Relative contribution of the group to the overall CS rate (%)
1(Nulliparous, single cephalic, ≥37weeks, spontaneous labor)	8	444	17.5	1.8	0.3	1.4
2 (Nulliparous, single cephalic, ≥37 weeks, induced labour or CS before labour)	171	284	11.2	60.2	6.8	28.5
2a(Labour induced)	48	161	6.3	29.8	1.9	8
2b(Pre-labour CS)	123	123	4.9	100	4.9	20.5
3 (Multiparous without previous CS, single, cephalic, ≥37 weeks, spontaneous labour)	3	604	23.9	0.4	0.1	0.5
4 (Multiparous without previous CS, single, cephalic, ≥37 weeks, induced labour or CS before labour)	121	186	7.3	65	4.8	20.2
4a(Labour induced)	23	88	3.4	26.1	0.9	3.8
4b(Pre-labour CS)	98	98	3.9	100	3.9	16.4
5(Multiparous with previous CS, single, cephalic, ≥37 weeks)	195	380	15	51.3	7.8	32.4
5.1(With one previous CS)	110	292	11.5	37.6	4.4	18.3
5.2 (With two or more CS)	85	88	3.5	96.5	3.4	14.1
6 (All nulliparous breeches)	27	43	1.7	64.2	1	4.4
7(All multiparous breeches (Including previous CS))	5	49	1.9	10.2	0.2	0.9
8 (All multiple pregnancies (Including previous CS)	48	182	7.2	26.3	1.9	7.9
9 (All transverse or oblique lies (including previous CS)	20	20	0.8	95.2	0.8	3.3
10 (All preterm single cephalic, <37 weeks	3	333	13.1	0.9	0.1	0.5

(Including previous CS)						
Total	601	2525	100	23.8	23.8	100

Group size (%)=n of women in the group/total number of women who gave birth in the hospital×100.
Group CS rate (%)=n of CS in the group/total number of women in the group×100.
Relative contribution (%)=n of CS in the group/total number of CS in the hospital×100.
Absolute contribution (%)=n of CS in the group/total number of women who gave birth in the hospital×100.
Table can lead to useful insights into the quality of data collection, the type of population served by the hospital, the CS rates of each group and how each of the individual 10 groups contributes to the overall rate of CS in your setting, and the overall philosophy of care of in a maternity unit.
Indications for caesarean section among women who delivered at NTRH

The indications for caesarean section among the women under study included; fetal distress (29.3%), previous CS scar (20.3%), prolonged labour (19.8%) and least contributors included pre-eclampsia and malposition (2.7%) as indicated in figure 1.

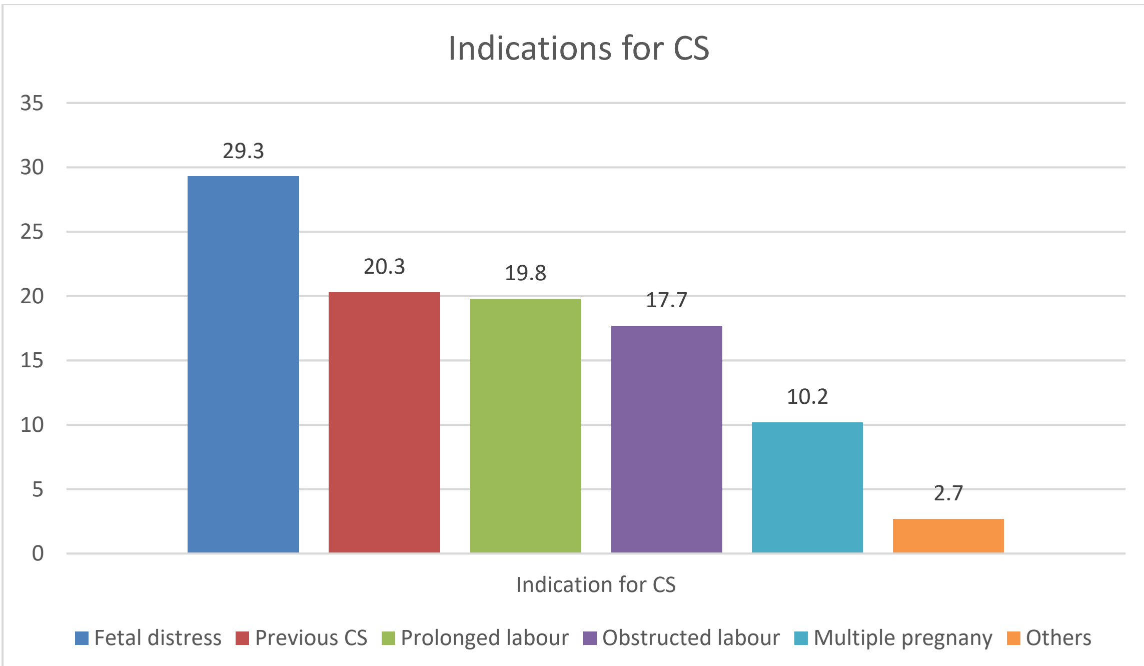

Figure 1: Indications for caesarean sections among women who delivered in NTRH

IV. Discussion

In this study the results shall be interpreted based on the Robsons´s implementation manual [1]. Thus, we assessed the quality of the data, the population attending the services. According to Robson´s classification the total population of group 1 and group 2 should represent mothers who mostly have one child. However, in our study, the percentage of group 1 and group 2 was represented by 28.8%. this implies that majority of the participants were multiparous women with more than one child. Group 4 and group 5 should represent 30% of the women under study, in the current study the two groups were represented by 31.2% which is slightly higher that the standard rate. This also supports the fact that the population under study was multiparous women with more than one child. Group 5 should be roughly half of the total CS rate, in our study, the group 5 was represented by 15% meaning there had been high CS rates indicated by Group 1 and Group 2 previously. The total rate for Group 6 and Group 7 should be at 3-4%, in the current study the two groups were represented by 3.6%. Group 8 should be between 1.5-2%, the study findings indicate the Group to be represented by 7.2% which is higher than the normal rates. This was because the Nyahururu County Referral Hospital is a tertiary hospital and runs reproductive health clinics for high-risk mothers. Finally, group 10 should be less than 5%, however, in the current study it was at 13.1%. the percentage in this group is usually higher if the hospital is probably tertiary (high risk, referral) or there is a high risk of preterm births in the population that the hospital serves. If, in addition, the CS rate is low in this group, it could represent a preponderance of spontaneous preterm labour. These guidelines conform to the characteristics of the facility where the study was conducted.

The ratio of the size of Group 1 verses Group 2 should normally be 2: in the current study, the ratio was 3:2 which is slightly lower than the expected. This implies that in the current population, there were high induction/prelabour CS issue which may indicate a high-risk population in nulliparous women and are likely therefore to have a high CS rate. The ratio of the size of group 3 verses group 4 should be higher than that of group 1 and group 2. The current study findings show that the ratio of group 1 and group 2 was 1.5 while that of group 3 and group 4 was at 3.2 which is higher, this confirms data quality was high. The ratio size of group 6 and 7 should be 2:1, the current study findings were at 0.8 this also confirms accurate data collection.

The study found that the CS rate was at 23.8% higher than the recommended rate by WHO which should be below 10-15% [2]. However, it lower than CS rates reported previously A study on caesarean rates among selected hospitals in Nairobi Kenya showed that Private hospitals were at 44%, Mission/Private hospital at 25% and public hospital at 29% respectively [9].

Group 5, group 2 and group 4 were the main contributors of the overall CS rate in the hospital. These results are different to those reported in Ethiopia that indicated that Robson group 3 (multiparous women with single cephalic full-term pregnancy in spontaneous labour with no history of CS), group 5 (multiparous women with single cephalic full-term pregnancy with history of CS) and group 1 (single cephalic nulliparous women full-term pregnancy in spontaneous labour) were the major contributors to the overall CS at 21.4%, 21.1% and 19.3%, respectively [13]. The difference may have been brought about by the difference in population under study. However, in another study in Ethiopia, it was indicated that the largest contributors to the overall CS rate were Group 10 (19.1%), Group 2 (18.3%), Group 5 (17.1%), and Group 4 (15.8%). There was also a high rate of pre-labor CS in Group 2, Group 4, and Group 10 [14]. These results partly concur with the results in the current study.

V. Conclusion

The study concluded that the CS rate was higher than WHO set rates. The main contributors for the high CS rate were group 5 (multiparous women with at least one previous CS), group 2 (Nulliparous, single cephalic, ≥37 weeks, induced labour or CS before labour), and group 4 (Multiparous without previous CS, single, cephalic, ≥37 weeks, induced labour or CS before labour). The main indications for CS in the population under study was fetal distress, previous CS scar, prolonged labour and least contributors included pre-eclampsia and malposition respectively.

VI. Study limitations

The study also had some limitations. The study was conducted in a single hospital, and since it is a referral hospital, the selection of participants may be biased to some degree, and for this reason the findings might be less generalisable. However, standardisation according to Robson is able to be used in such situations. Its use permits valid and useful comparisons to be done even at different levels of care. Another limitation involved inconsistent use of partogram and fetal heartbeat monitoring. This makes the criteria for decisions and indications for CS unclear and left much up to individual doctor's discretion. The manual for interpretation of CS rates stated that the size of group 9 (women with transverse lie, singletons pregnancy), should be less than 1% of the total and the CS rate should be 100% for this group, however, in our study, the size of group 9 was 0.8% and the CS rate in this group was 100%.

Acknowledgements: We would like to thank Nyahururu County referral and teaching hospital for creating a conducive environment in order to accomplish the research
Contributors: JOB who conceived the study, FAA and BW who immensely contributed in the development and analysis of the study. All authors contributed to the writing of the proposal and final version of the manuscript.
Funding: No funding was sourced, the authors funded the research
Data availability statement: Data are available upon reasonable request
Competing interests: Not declared

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