ORIGINAL RESEARCH

Factors Associated with High Rates of Caesarean Deliveries: A Cross Sectional Study Classifying Deliveries According to Robson in Mengo Hospital Kampala

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Introduction: The number of caesarean section (CS) continues to rise worldwide. CS can improve outcomes in infants and mothers. However, if used improperly, the potential harm can outweigh the potential benefits.

Aim: The study was to determine the factors associated with high cesarean section rates at Mengo Hospital.

Methods: This cross-sectional study used a mixed-method approach that included a retrospective review of 1276 casebooks using the Robson Ten Group Classification System (RTGCS) for births that occurred at Mengo Hospital in December 2018, January, and February 2019. Questionnaire was used for data collection from 200 mothers on second day after birth from 24th May to 19th July 2019. Eight key informants were interviewed within the same period. Quantitative data were analyzed using STATA V.14, thematic analysis for qualitative data. Univariate, bivariate, and multivariate analyses were performed to determine the association between predisposing factors and outcome variables using chi-square and modified Poisson.

Results: Caesarean section rate (CSR) from casebooks was 49% and 64% from the primary data. Group 5(Previous CS, single cephalic, >37 weeks) had (35.4%) to the total number of cesarean deliveries, followed by Group 1 (Nulliparous, single cesarean deliveries, >37 weeks in spontaneous labour), with 18.4%. Group 3 (ultiparous (excluding previous CS), single cephalic, >37 weeks of spontaneous labor) with (13.7%). The common indications from casebooks were a previous scar (32%), obstructed labor (18%), and previous scar (97.6%). Presence of an obstetric indication, influence of husband, friends, relatives, and mother's desire for a CS were closely associated with caesarean delivery. Mothers said that occurrence of CS was due to health workers reducing the stress of monitoring labour and financial benefits from CS deliveries by the hospital.

Conclusion: Repeat CS made the highest CSR contribution; therefore, strategies to reduce the frequency of the procedure should include avoiding medically unnecessary primary CS and encouraging vaginal birth after previous CS where applicable.

Keywords: Robson Ten Group Classification System, cesarean section, previous scar

Background

A caesarean section is a surgical procedure in which incisions are made through a woman's abdomen and uterus to deliver the baby. It is performed whenever abnormal conditions are making normal delivery difficult and endangering the life of the mother or baby. Caesarean section is the most common obstetric surgical procedure worldwide.[1] Although low caesarean delivery rates are associated with an increase in adverse events, higher-than-institution caesarean delivery rates have been shown not to improve maternal or neonatal outcomes but to cause additional costs and unnecessary interventions.[2] The WHO stated in 2015 that every effort should be made to make CS available to women in need, rather than aiming for a specific quota.[3] Especially in the urban areas of low-income countries, there has been an increase in CS birth rates.[4]

There is a global concern that the number of caesarean deliveries is increasing worldwide, regardless of health status, age, race, or gestational age. There is evidence that caesarean rates above 15% are not associated with further reductions in maternal and neonatal mortality and morbidity.[5] A CS can only effectively save the life of mother and child when it is medically justified. For mothers or infants who do not require a CS, there is no advantage to having it.[6] Recently, it has been reported that the caesarean delivery rate in the United States is steadily increasing.[7]

According to the latest data from 150 countries, 18.6% of all births are currently due to CS, ranging from 6% to 27.2% in the least and most developed regions. Latin America and the Caribbean have the highest rates of CS (40.5%), followed by North America (32.3%), Europe (25%), Asia (19.2%), and Africa (7.3%), based on the data from 121 countries, the trend analysis showed between 1990 and 2014.[3] In Bangladesh, there was an increase of caesarean deliveries from 4% in 2004 to 23% in 2014.[8] In Gambia, CSR in hospitals is 24.0% and the most common indications for a CS were a previous CS (20.6%) and a cephalopelvic disproportion (20.2%),[9] and in Nigeria, the cesarean rate was 27.6%, nearly three times higher than the 10.4% recorded at that center over two decades ago.[10]

In Uganda, according to the Health Sector Annual Performance Report for FY 2015/16, cesarean rates in HMIS increased progressively in 2014/15 from 5.8% to 7.0% per 1000 births in the population and the rate was very close to the UDHS of 6.2% for 2014–16. Caesarean Section (CSR) rates vary in different regions and in fiscal year 2006/2007; The annual health sector performance report 2011 reported the caesarean section rate for the Mbarara Regional Referral Hospital as 24.1%. According to the MRRH Annual Performance Report, it rose to 28.4% in fiscal 2008 and 28.5% in fiscal 2009. In 2010, the cesarean section rate fell slightly to 27.7%, according to internal data from the Department of Gynecology.

All women undergoing indicated or voluntary CSs are at risk of various complications and negative consequences for future pregnancies. Therefore, avoiding unnecessary CSs must be a top priority.[11]

An increase in CS has been observed to be among women of all ages and race/ethnicities, in every state, and is thought to be due to; decrease in vaginal births after Caesarean delivery (VBAC), decreased vaginal births of breech presentation, and increased prevalence of high-risk pregnancies such as advanced maternal age and some subjective indications during labour such as non-reassuring fetal status and arrest of dilation.[12]

A 2011 systematic review of 27 caesarean section classification systems by Torloni et al identified the ten-group classification system proposed by Robson (RTGCS) in 2009 as the most appropriate for comparing surgery rates.[13] Robson's system classifies all deliveries into one of ten groups based on five parameters: birth history (parity and prior caesarean section), onset of labor (spontaneous, induced, or cesarean section before labor onset), fetal presentation or miscarriage (cephalic section, breech presentation, or transverse), number of newborns, and gestational age (premature or term-term). The ten Robson categories are mutually exclusive, totally inclusive, fully comprehensive, and can be applied prospectively, since any woman admitted to childbirth can be immediately classified based on a few variables that are generally routinely recorded. This system supports institution-specific monitoring and auditing and provides a standardized method of comparison between institutions, countries, and points in time. The Robson classification was used to analyze trends and determinants of CS use in healthcare settings in both high- and low-income countries[3] and has also been applied to state, national, and international datasets, including data from eight Latin American countries as part of the WHO Global Survey of Maternal and Perinatal Health.[14]

In Uganda, there is an increase in CSR, according to the level of care: HC, IV 6.3%; General Hospitals, 22%; Regional Referral hospitals, 25%; and Mulago National referral hospitals, 25%. Most Regional Referral Hospitals are above the recommended CSR; only two, Gulu and Moroto, are below the recommended rates, and most private, not for profit, are below the recommended rates.[15] Unlike other Private not for profit hospitals, Mengo Hospital in 2018 had high rates of CS, as per the trend of mode of delivery from their hospital records shows: In 2014/15, CS deliveries in general maternity wards were 40% and 46% in private, 2015/16; CS deliveries were 36% in general maternity ward and 48% in private, for 2016/17; CS was 41% in general and 49% in private, in 2017/18, CS in general wards was at 42% and at 46% in private.

Regardless of the reason, given the low rates of caesarean section in Africa (as well as Uganda), the increasingly increasing caesarean rates at Mengo Hospital are a cause for concern and the appropriateness of case selection for the procedure. The aim of this study was to identify the factors associated with the high birth rate by caesarean section at Mengo Hospital and to recommend measures that could be taken to prevent unnecessary caesarean sections.

Methods and Materials

A cross-sectional design, employing a mixed-method approach, was used. The study also involved a retrospective review of records; this was because the RTGCS involves a review of records, and if it was to be done prospectively, it would take a long period of time.

The study was conducted at Mengo Hospital, Uganda's oldest hospital, with an average of 300 deliveries per month and eight obstetricians.

The target population was mothers who delivered either normally or by CS in Mengo Hospital between 24th May and 19th July 2019 were enrolled for primary data and those who underwent caesarean delivery or a normal delivery for December 2018, January, and February 2019 data from records was used for secondary data. Primary data was collected because client-related factors are best obtained from postpartum mothers.

Additional information was obtained from eight key informants: two ward in-charges, two ward managers, two specialist Doctors, and two senior midwives, who were purposely selected for their experience and key role in decision-making about the mode of delivery. The sample size for primary data was determined using Kish-Leslie formula (1965) $n = (Z\alpha/2^2 PQ)/e^2$ and sample size for this study was 200 mothers.

Secondary data was retrieved from casebooks for three months: December 2018, January, and February 2019, because RTGCS involves the use of records for auditing and analysis of CSR, the months were selected because, by the time of data collection, the casebooks for that period were all collected from the maternity wards to records department and could provide the current picture concerning caesarean delivery in the hospital.

Sampling Methods

Consecutive sampling was used to enroll second day postpartum mothers to be interviewed for primary data.

All the casebooks for mothers who delivered for the month of December 2018, January and February 2019 were reviewed.

Eight key informants were selected purposively.

The outcome variable in this study was cesarean delivery. This was measured by reviewing the mothers' casebooks to determine CS rates over a three-month period using Robson system classification, which provides a framework for monitoring and reviewing CS rates. It is based on four obstetric concepts: pregnancy category, birth history, course of pregnancy, and gestational age. On this basis, the women were divided into ten groups. For each group were the CS rate (number of CSs/total deliveries), relative size (total deliveries in each group/total deliveries), and absolute contribution to the total CS rate (CS deliveries in each group/total deliveries) calculated. CS delivery was also calculated as the proportion of women delivering via CS at the time of the study.

Independent Variable

Medical/obstetric factors, previous caesarean section; eclampsia, preeclampsia, gestational diabetes, inhibition of labour, abnormal lie, premature rupture of membranes, placenta previa, and placental abruption.

Client-related factors: socioeconomic status, culture, beliefs, women's preferences, demographic factors, health insurance, and mode of delivery.

Institutional factors: economic gain/profit making, time management, surgical practice, labor monitoring stress, and referral cases.

External Factors

Demographic variables included age, highest level of education, religion, place of residence, occupation, tribe, marital status, and parity. These were evaluated as categorical variables.

Data Collection Tools and Procedure

The Robson Ten Group Classification System (RTGCS), which provides a framework for monitoring and reviewing CS rates, was used to collect data from casebooks. On this basis, the women were divided into ten groups. The classification

process is mutually exclusive and inclusive, meaning each woman only fits into one group and one group only. Semi-structured, investigator-administered, closed- and open-ended questionnaires were used to collect data on obstetric indications, as well as institutional and client-related factors associated with high rates of CS from mothers on the second day postpartum, who were present in general and private maternity wards at the time of data collection. An interview guide was used to collect additional data on the factors associated with the increased rates of CS from key informants.

Data Quality Control Procedure

A pre-visiting of the study area was done; the instruments of the study were pre-tested in a hospital outside the study area to ensure the clarity of the questionnaire and to achieve the desired objectives. The pre-test was performed on 5% of the total sample size. In addition, content and face validity were reviewed by another maternal health expert. Questions that were ambiguous were modified and two research assistants; midwives from private departments, were trained. These were selected basing on being knowledge of the contributing factors to high rates of cesarean births. Data was edited at the end of the interviews to ensure accuracy, consistency, and completeness of responses. The principal investigator and research assistants made appropriate corrections there and then by reading through each complete questionnaire, confirming with each respondent whether the information was clear.

Data Analysis Plan

Data analysis was performed with Stata Version 14 (StataCorp, College Station, TX).

At univariate level, descriptive statistics was performed to obtain frequencies. At the bivariate level, chi-square (Pearson chi-square or Fisher's exact test) was used to test for the association between independent variables and the outcome variable (caesarean delivery). Bivariate Poisson regression for caesarean delivery on each independent variable was performed to identify the variables for inclusion in the multivariable model. The inclusion criterion used for the multivariable model was a p-value of less than 0.25 ($P<0.25$). A multivariable Poisson regression model was used to assess the associations between dependent and independent variables using a stepwise process. The level of significance was 5% ($\alpha=0.05$), two-tailed with 95% confidence interval (CI).

Data from the records were classified into 10 mutually exclusive and fully inclusive Robson groups with subgroup modifications according to the recommendations of the Society of Obstetricians and Gynecologists of Canada.[16] Data falling into all Robson groups was screened for pre-existing maternal health problems (chronic hypertension, pre-existing diabetes, and heart disease) and obstetric complications (gestational hypertension, gestational diabetes, preeclampsia and intrauterine growth restriction, premature rupture of membranes, placenta previa, and placental abruption). For each group was the CS rate (number of CSs/total deliveries), relative size (total deliveries in each group/total deliveries), and absolute contribution to the total CS rate (CS deliveries in each group/total deliveries) was calculated.

Overall factors associated with the high cesarean rates were analyzed using Poisson regression to obtain the expected outcomes and their 95% confidence intervals, p-values, and corresponding coefficient of determination (R^2) CS as the overall primary outcome. All associations were considered statistically significant at p-values of ≥0.05. A bivariate analysis was performed using modified Poisson regression for each variable to determine associations and obtain unadjusted raw prevalence-risk ratios. A multivariate analysis was performed using a modified Poisson regression accounting for potential confounders to control for potential confounders.

Qualitative Data from the Key Informants Was Analyzed by Thematic Analysis

Data from the KIIs was stored in audio recorders and in written notes. Verbatim transcription of audio data was performed. The audio recordings were transcribed directly into English. This was combined with the data in the written notes to get well-organized data. The transcribed data was stored using interview identifiers. Audio records were destroyed after the completion of the dissertation defense.

Thematic analysis was used to analyze the transcribed data from interviews with key informants. The transcripts were read several times to familiarize them with the data. Codes were derived from the transcripts and categorized into themes.

Themes on factors associated with high CSR were generated. Data were presented in text using quotes that were arranged under the developed themes.

Ethical Considerations

Ethical approval for the study was obtained from Makerere University School of Public Health, the Higher Degrees Research Ethics Committee (HDREC), and the Uganda National Council of Science and Technology (UNCST), a letter of approval for data collection, and a letter of introduction from administrators of the Mengo Hospital was issued. Respondents were informed of the purpose of the study prior to administering any research tool. Participants were assured that the information obtained from them would be treated with the utmost confidentiality and that information obtained from them would be published; therefore, their names and titles were not required and written informed consent was obtained to participate in the study. For the review of medical records, a Waiver of consent form was granted from IRB sincere-contacting this number of patients to obtain informed consent would be impracticable and would hinder our ability to conduct the study and no greater than minimal risk and will have no direct impact on patient's rights, welfare, or clinical care and to minimize risk of a breach of confidentiality during medical record review and data collection. Patient names were not captured on the abstraction tool to make certain confidentiality. Further, this study complies with the declaration of Helsinki.

Results

This section presents the research findings of this study to assess the factors associated with the high rates of caesarean delivery in Mengo Hospital. These findings were presented as per the objectives of the study, in which a total of 200 postpartum mothers were enrolled for primary data that was collected from 24/5/2019 to 19/7/2019. The study also used secondary data in which casebooks from December 2018, January and February 2019 for mothers who delivered at Mengo Hospital were reviewed. Total number of deliveries from the casebooks was 1307; 649 had a normal vaginal delivery and 627 delivered by CS. The response rate for primary data was 100%. Out of 200 second day postpartum mothers who were interviewed, 71 had a normal vaginal delivery, whereas 129 mothers delivered by CS. The Caesarean Section Rate (CSR) among the study subjects from the casebooks (secondary data) was 49%, whereas from the primary data, the CSR was 64%.

Background Characteristics from the Case Books of Mothers

Table 1. Presents background characteristics: according to the birth weight out of the 63 babies who were between 1500–2499gms, majority 40 (63.5%) of the babies were delivered by CS, and there were no babies less than 1000gms in the records reviewed. According to the presentation, out of 60 babies whose presentation was abnormal, an overwhelming number, 58 (97%) were delivered by CS, concerning the number of fetuses, out of 33 multiple pregnancies, majority 26 (79%) were delivered by CS.

According to gestational age among mothers who were >37 weeks, out of 1099 mothers, 482 (44%) out of delivered by CS and out of 278 mothers between 21–25 years, 140 (50.3%) were delivered by CS.

According to parity, of 807 nulliparous women, 146 (43%) delivered by CS, while for the referral status, of 233 mothers who were referred, 192 (82%) delivered by CS.

According to the mode of payment, of 145 women who were insured, 76 (52%) delivered by CS.

Demographic Characteristics of Second Day Postpartum Mothers

The socio-demographic characteristics of the respondents are summarized in Table 2, according to age out of the 103 mothers who were between 20–29 years majority 66 (68%) delivered by caesarean section.

Regarding marital status, out of 192 mothers who were married, an overwhelming number, 125 (65%) delivered by CS, and of 69 who were protestants by religion, majority 48 (70%) delivered by CS. Out of 113 mothers whose number of pregnancies was 1–2 majority, 79 (70%) delivered by CS. According to occupation, out of 84 mothers who were formally employed, more than a half 58 (69%) delivered by CS.

Table 1 Background Characteristics from the Case Books of Mothers Who Delivered in December 2018, January and February 2019

Variable	Total Deliveries	Vaginal Deliveries n(%)	Caesarean Deliveries n(%)
Birth weight			
<1000 GMS	00	00(00)	00(00)
1000–1499	05	03(60)	02(40)
1500–2499	63	23(36.5)	40(63.5)
2500–3999	1034	573(55.4)	461(44.6)
>4000	99	44(47.5)	52(52.5)
Presentation			
Cephalic	1126	642(57)	484(43)
Abnormal	60	02(03)	58(97)
No, of foetuses			
Single	1123	640(57)	483(43)
Multiple	33	07(21)	26(79)
Gestational age			
≥37 weeks	1099	617(56)	482(44)
30–36 weeks	65	18(28)	47(72)
<30 weeks	03	00(00)	03(100)
Maternal age			
<18 years	02	01(50)	01(50)
18–20	21	10(47.7)	11(52.3)
21–25	278	138(49.7)	140(50.3)
26–30	462	256(55.4)	206(44.6)
31–35	264	133(50.4)	131(49.6)
>35	118	61(51.7)	57(48.3)
Parity			
Nulliparous	341	195(57)	146(43)
Multiparaous	807	459(56.9)	348(43.1)
Referral status			
Referral	233	41(18)	192(82)
Not referral	920	597(65)	323(35)
Mode of payment			
Insurance	145	69(48)	76(52)
Not insured	985	565(58)	420(42)

Note: Data source: Secondary data.

Contribution of Each Robson Group to the High Caesarean Section Rate in Mengo Hospital Basing on Robison's Ten Group Classification Criteria System

Contribution of Each Robson Group

According to Table 3. The majority of caesarean deliveries (n=211) were mothers who had previous CS, single cephalic, >37 weeks (group 5), followed by group 1; Nulliparous, single cephalic, >37 weeks in spontaneous labor (n=110), and the least number was from group 6, all nulliparous breeches (n=04).

Table 2 Demographic Characteristics of Second Day Postpartum Mothers from 24th May to 19th July 2019 at Mengo Hospital N=200

Variable	Caesarean delivery n(%)	Vaginal delivery n(%)
Age		
<20 years	3(75)	1(25)
20–29	66(65)	37(35)
30–39	58(65)	31(35)
40–49	2(50)	2(50)
Marital status		
Married	125(65)	67(35)
Single	3(43)	4(57)
Separated/Divorced	1(100)	0(00)
Religion		
Catholic	34(57)	26(43)
Protestant	48(70)	21(30)
Muslim	18(56)	14(44)
Others	29(74)	10(26)
No, of pregnancies		
1–2	79(70)	34(30)
3–4	39(58)	28(42)
5–10	11(55)	9(45)
Level of education		
No formal education	1(17)	5(83)
Primary education	5(71)	2(29)
Secondary education	39(64)	22(36)
Tertiary education	84(67)	42(33)
Occupation		
Formal employment	58(69)	26(31)
Self-employment	49(65)	26(35)
House wife/unemployment	22(54)	19(46)

Note: Data source: Primary data.

Table 3 RTGCS for Case Books of December 2018, January and February 2019 of Postpartum Mother at Mengo Hospital

Robson Group	Description	Total Deliveries	Caesarean Deliveries
1	Nulliparous, single cephalic,>37 weeks in spontaneous labour	255	110
2	Nulliparous, single cephalic,>37 weeks induced or CS before labour.	76	48
3	Multiparous (excluding previous CS), single cephalic,>37 weeks in spontaneous labour.	472	82
4	Multiparous (excluding previous CS), single cephalic,>37 weeks induced or CS before labour.	101	53
5	Previous CS, single cephalic,>37 weeks.	220	211
6	All nulliparous breeches	04	04
7	All multiparous breeches (including previous CS).	17	15
8	All multiple pregnancies (including previous CS).	33	25
9	All abnormal lies (including previous CS).	57	47
10	All single, cephalic,<36 weeks (including previous CS).	41	32

The Classification of the Contribution of Each Robson Group

Results in Table 4 show that group 5(Previous CS, single cephalic, >37 weeks) had the highest contribution (35.4%) to the total caesarean deliveries (n=627), followed by group 1(nulliparous, single cephalic, >37 weeks in spontaneous labor) (18.4%), and then group 3(multiparous (excluding previous CS), single cephalic, >37 weeks in spontaneous labor) with (13.7%).

Table 4 The Classification of Each Group According to Robson Groups for Case Books of December 2018, January and February 2019 of Postpartum Mother at Mengo Hospital

Group #	Total Number of CS Deliveries/Total Number of Deliveries in the Institution 627/1276	Size of Group	% CS Deliveries in a Group	Contribution of Each Group on the CSR	Contribution of each Group on the total CS Deliveries (n=627)
1	110/255	19.98	43.1	8.6	18.4
2	48/76	5.95	63.15	3.8	8.05
3	82/472	36.99	17.4	6.4	13.7
4	53/101	7.91	52.5	4.2	8.9
5	211/220	17.2	95.90	16.5	35.4
6	04/04	0.31	100	0.3	0.6
7	15/17	1.33	88.2	1.8	2.5
8	25/33	2.58	75.15	1.95	4.1
9	47/57	4.46	82.45	3.7	7.9
10	32/41	3.21	78.04	3.7	5.4

Size of group = number of women in each group/total number of women in the population ×100% caesarean delivery rate in

Group = the number of caesareans carried out in each group/the number of women in each group×100% of contribution of

Each group = the number of caesarean deliveries in each group/the total number of women in the population×100

Medical/Obstetrical Indications Associated with the High Rates of Caesarean Section in Mengo Hospital

The Contribution Obstetrical Indication to the High Rates of Caesarean Delivery Basing on Robson Groups

The most common indication for caesarean delivery was previous scar 32% (n=207), followed by obstructed labour 18% (n=114), whereas the least indication was for Cs was reduced fetal movement (Table 5).

Qualitative Results

Obstetrical Factors Influencing High Rates of Caesarean Deliveries in Mengo Hospital

Almost all Key informants highlighted obstetrical reasons as major reasons for the high rates of caesarean delivery in the hospital because the hospital being the first hospital in Uganda has a long tract of records for managing patients and therefore is a referral centre for many mothers with complications from peripheral centres, as explained by the following quotes:

There is no other reason for CS.hmm of course there obstetrical reasons like foetal distress, obstructed labor, previous scar hmmm….and so many others. Yeah,and being a regional referral hospital we also get mothers who are referred here for CS. Hmm people have reasons why they come here. All CS have indications, we do not just do CS and the good thing the outcome is always good. (**KII Ward Manager)**

Most of the CS are emergencies, most of our mothers from here [our own] deliver vaginally most are referred from peripheral centres and you find that at the end of the day CS mothers are more than the normal deliveries or numbers are almost even [50:50] and that is because of the fact that it is a regional referral and it being a well-known hospital most of the mothers with elective CS wish to do their CS from here. (**KII Obstetrician)**

Table 5 The Indications for CS as for Case Books of December 2018, January and February 2019 of Postpartum Mother at Mengo Hospital Using RTGCS

	ROBSON GROUPS										
	1	2	3	4	5	6	7	8	9	10	Total
INDICATIONS											
Previous C-section	00	00	00	00	200	00	02	04	01	00	207
Pre-eclampsia and eclampsia	04	03	08	06	04	00	00	00	00	00	25
Obstructed labour	59	13	26	11	00	00	04	01	00	00	114
Abnormal lie	08	02	05	02	00	01	05	09	05	00	37
Pre-mature rupture of membranes	07	05	06	05	01	00	01	04	00	00	29
Placenta previa	00	01	04	05	01	00	00	00	00	00	11
Placenta abruption	02	01	02	05	01	00	00	00	00	00	11
Twins	00	00	00	00	00	00	00	25	00	00	25
Feotal distress	13	21	26	12	02	00	01	00	00	00	75
Post date	03	14	02	14	02	01	00	01	00	00	37
Olygohydromnious	05	09	08	13	01	00	00	02	00	00	38
CPD	03	01	02	02	04	00	00	00	00	00	12
Prolonged labour	05	00	02	00	00	00	00	00	00	00	07
Maternal request	00	02	01	00	01	00	00	00	00	00	04
Big baby	02	02	01	04	02	00	00	00	00	00	11
Reduced foetal movement	00	05	00	01	00	00	00	00	00	00	06
Total	111	79	93	80	219	02	13	46	06	00	649

Notes: Data source; secondary data the number raised from 627 that was used to calculate the to 649 because of case books that had more than one indication for c/s.

It was revealed that the hospital conducts maternal audits and protocols before the mode of delivery is determined. In so doing, the reason obstetrical factors were the cause for the high rates of Cs deliveries in the hospital was further emphasized by the following quotes:

We have maternal and clinical audits; when we all sit and agree that yes this mother deserves a CS, of course you cannot be there deep in the night may be sleeping and they call you.Dr There is a mother 2 cm dilated with too many contractions and then you do not come because your aim is to reduce CS.[NO].Our aim is to see that mothers go with a live baby. **(KII Obstetrician)**

It is because of their obstetrical indication because we have protocols for conducting CS, Normal labor, induction of labor and are pinned here, and the other thing most mothers with previous Scar come back before 2 years with a fresh scar which is an automatic CS **(KII senior Midwife in charge)**

The Contribution of Obstetrical Indication of the Second Day Postpartum Mother

Findings from primary data, Table 6, indicate that the most common indication from the mothers who delivered by caesarean delivery was previous scar 42 (97.6%), followed by fetal distress 25 (100%), and then obstructed labor 24 (92.3%).

Table 6 The Contribution of Obstetrical Indication of the Second Day Post-Partum Mother in Mengo Hospital from 24th May to 19th July 2019 to the Caesarean Delivery

Obstetrical Indication	MOD	
	Vaginal Delivery	Caesarean Delivery
Foetal distress	0(00)	25(100)
Obstructed labour	2(7.6)	24(92.3)
Previous scar	1(2.3)	42(97.6)
Post date	0(00)	3(100)
HT(Pre-eclampsia/Eclampsia)	0(00)	9(100)
Others	0(00)	19(100)

Note: Data source: Primary data.

Client Related Factor Associated with the High Rates of Caesarean Section in Mengo Hospital

Results from the analysis with Fisher's exact test indicated that the presence of obstetric indication, influence of the decision for CS by husband, friends, relatives, and maternal request for CS were strongly associated with caesarean delivery (Table 7).

Table 7 Bivariate Chi-Square Fisher's Exact Test Analysis of Factors Associated with Post-Partum Mother at Mengo Hospital

Factors/Characteristics	MOD		
	Vaginal Delivery n (%)	Caesarean Delivery n (%)	P-value
Age			
Less than 20 years	1(25)	3(75)	
20–29	37(35.9)	66(64)	
30–39	31(34.8)	58(65)	
40–49	2(50)	2(50)	0.890
Marital status			
Married	67(34.9)	125(65.1)	
Single	4(57.3)	3(42.86)	
Separated/divorced	0(0.00)	1(100)	0.409
Religion			
Catholic	26(43.3)	34(56.6)	
Protestant	21(30.4)	48(69.5)	
Muslim	14(43.7)	18(56.2)	
Others	10(25.6)	29(74.3)	0.178
No, of pregnancies			
1–2 pregnancies	34(30)	79(69.9)	
3–4 pregnancies	28(41.7)	39(58.2)	
5–10 pregnancies	9(45)	11(55)	0.181
Level of education			
No formal education	5(83.3)	1(16.6)	
Primary education	2(28.5)	5(71.4)	
Secondary education	22(36)	39(63.6)	
Tertiary education	42(33.3)	84(66.6)	0.104

(Continued)

Table 7 (Continued).

Factors/Characteristics	MOD		
	Vaginal Delivery n (%)	Caesarean Delivery n (%)	P-value
Occupation			
Formal employment	26(30.9)	58(68)	
Self employment	26(34.6)	49(63.6)	
House wife/unemployment	19(46.3)	22(53.6)	0.242
Presence of indication			
No	68(91.8)	6(8.1)	
Yes	3(3.2)	123(97.6)	0.000*
Influence of decision for CS			
Husband, friends, relatives	67(94.3)	4(5.63)	
None	4(3.1)	125(96.9)	0.000*
Maternal request			
Yes	1(2.4)	40(97.5)	
No	70(44)	89(55.9)	0.000*
Presence of institutional reasons			
Yes	0(00)	14(00)	
No	71(38.1)	115(61.8)	0.003*
Institutional reasons for CS			
Economic gain, reduce stress of labour monitoring	1(5)	19(95)	
None	70(38.8)	110(61.1)	0.000*

Note: Data source; Primary data P-value >0.05*.

Client Related Factors Influencing the High Rates of CS in Mengo Hospital

When the key informants were interviewed about client-related factors that influence the high rates of CS in Mengo Hospital, mothers did not wish to push (vaginal delivery), and others requested because of their indications. The following quote explains this.

Maternal Request for CS

The majority of the key informants said that some mothers requested CS because they did not want pain, although they were not the majority who requested it, and other requests because of their already known indication. The request for CS or maternal desire was counted as one of the contributing factors to the high rates of CS in the Hospital. The quotes below all include the following:

> Yes I say Caesarean rates are high here but it is because of reasons and there are so many factors. There a few who come and they are like Dr. Me I do not have indications but I want a Caesarean delivery however there not the majority. (KII Obstetrician)

> You find that elective CS are higher than the emergencies many times those who had previous Scar they do not wish to push, even if you try to explain that if you do not have any other indication you can make it.They will always say that Dr even if there is no other reasons from my past experience I cannot. So previous uterine scars also contribute to high rates of CS…you rarely find prime gravidas having elective CS unless it is fetal distress or obstructed labor. (KII Obstetrician)

Patient's Demographic Factors

Results from the key informants pointed out that the demographic factors of the respondents influencing the high rates of CS in Mengo Hospital KII Midwife explained the following:

> There some related factors like age, some of them are elective CS. Now for example those mothers above 40 years who are to deliver precious babies. You cannot risk with a vaginal delivery. It is always an automatic CS.others are having chronic

diseases". Additionally, KII Midwife said that "of course other mothers are candidate mothers of CS because I have seen many of them coming that we prefer being operated in Mengo Hospital since they already know there MOD is CS.

Modified Poisson Regression Analysis of Factors Associated with Caesarean Delivery

In bivariate analysis, two client-related factors, presence of indication and maternal request, were significant; however, at the multivariate level, these two factors were not significant. Mothers who delivered by CS because of obstetrical indication were 12.03 times higher than those who had no indication (unadjusted PRR=12.03, 95% CI 5.58–25.99). Mothers who requested for CS were 1.74 times higher than that those who did not request (unadjusted PRR=1.74, 95% CI 1.50–2.02).

Institutional Related Factor Associated with the High Rates of Caesarean Section in Mengo Hospital

As shown in Table 8, for bivariate institutional reasons, such as the economic gain of the institution, reduced stress of monitoring labor was associated with caesarean delivery. Mothers who said that the occurrence of CS was as a result of the health workers to reduce the stress of monitoring labor 17.7 times higher that of those who said none of the institutional reasons caused them to deliver by CS (un adjusted PRR=17.75, 95% CI 5.10–61.75). Mothers who said that the occurrence of CS was as a result of profit gain of the institution were 23.7 times higher that of those who said none of the institutional reasons caused them to deliver by CS (un adjusted PRR=23.67, 95% CI 7.79–71.83).

In the multivariate analysis, the economic gain of the institution reduced the stress of monitoring. Mothers who said that the occurrence of CS was as a result of the health workers to reduce the stress of monitoring labor 13.2 times higher that of those who said none of the institutional reasons caused them to deliver by CS (adjusted PRR=13.24, 95% CI 2.49–70.29). Mothers who said that the occurrence of CS was as a result of profit gain at the institution were 17.8 times higher than of those who said none of the institution reasons caused them to deliver by CS (adjusted PRR=17.78, 95% CI 3.75−84.31), after adjusting for presence of indications and maternal request.

Table 8 Modified Poisson Regression Analysis of Factors Associated with Caesarean Delivery at Mengo Hospital

Factors/ Characteristics	MOD			P-value	APR (95% CI)	P-value
	Vaginal Delivery n (%)	Caesarean Delivery n (%)	CPR (95% CI)			
Presence of indication						
No	68(91.8)	6(8.1)	1.00		1.00	
Yes	3(3.2)	123(97.6)	12.03(5.58–25.99)	0.000*	1.35(0.66–2.75)	0.40
Maternal request						
No	70(44)	89(55.9)	1.00		1.00	
Yes	1(2.4)	40(97.5)	1.74(1.50–2.02)	0.000*	1.08(0.94–1.24)	0.26
Institutional reasons for CS						
None	70(38.89)	110(61.11)	1.00		1.00	1.00
Reduce stress of labour monitoring	1(25)	3(75)	17.75(5.10–61.75)	0.000*	13.24(2.49–70.29)	0.002*
Profit gain	0(0.0)	16(100)	23.67(7.79–71.83)	0.000*	17.78(3.75–84.31)	0.000*

Notes: Data source: Primary data P-value >0.005, *Meant statistically significant.
Abbreviations: CPR, Crude prevalence Risk ratio; APR, Adjusted prevalence Risk ratio.

Institutional Related Factors Influencing the High Rates of CS in Mengo Hospital

Institutional factors also contribute to the high rates of caesarean deliveries; these factors include profit gain in the form of professional fees and fear of litigation. When key informants were interviewed about institutional factors, the following quotes emerged.

Profit Gain

Concerning the factor that high CS rates are due to profit gain of the institution and also gains in the form of profession fees. Some of the key informants denied allegations, whereas others agreed that it was also a key factor. This is evidenced by the following quote.

KII Midwife, profit gain is a factor here, of course there also cases where the indication is not all that…but someone sees that when I perform CS I get more fee [professional fee], so CS will continuously be high because of previous scars.

KII Obstetrician. They say there is an issue of profit benefit because we get professional fee but no because you sometimes find CS higher in general wards [where there is no professional fee] than in private wards.

Fear of Litigation

Fear of legal implications is another reason that has emerged as one of the factors leading to a high rate of CS delivery. The majority of the KI explained that mothers threaten to drag them into the courts of law in case they hesitate to take them for CS, yet it is out of their will.

KII Obstetrician explains; These days the litigation cases are very high and mothers are informed…as the midwives are calling, …"Dr there is obstructed labor meconium stained". Mothers are aware. And you find the mother is like Dr if something bad happens to me or my baby [threatening to take legal action].Dr, please. And you know we are working on high pressures that the outcome should always be good no one tolerates a bad outcome.

Novice Doctors Want to Practice Skills

The results of the interviews indicated that the high rates of CS were not because intern doctors needed to practice skills. It was emphasized that novice doctors practice in cases with indications for CS, as explained in the quote below:

"… intern Doctors work under supervision, from the outset they do not come on the ward and they are like today we should practice CS…Hmmm I mean CS is not a random selection that I will randomly pick on different mothers. They practice on mothers who have indications otherwise there is a group that may come when mothers have no indications and they miss out". KII Obstetrician

Other institution-related factors that came out from interviews were the hospital having a number of specialists in that mothers came looking for skilled and specialized management, and that the hospital did not refer maternal conditions to other hospitals, which were also key factors that influenced the high rates of CS in the study area. This is explained in the following quote.

"I think the reason why CSR is high is because other hospitals refer to referral hospitals but for us we do not refer our clients anywhere we carryout CS in this hospital. And another reason for us we do not make patients over stay when they have got obstructed labor, when we have seen that somebody cannot make it. We need the mother to go back with a live baby because we need the lives of the two people; the mother and the baby. Yeah. The other important factor is that we have specialists here.We have around eight[8] well known gynecologists therefore people come looking for them and they do their CS from here". (KII Midwife ward in charge)

It can be inferred that high rates of CS in Mengo Hospital occur because of many interrelated factors, although the hospital has standard operating procedures that guide their practice; however, the main aim for the management of the mothers in the hospital is to see that every woman goes out alive with a live baby.

Discussion of Study Key Findings

The CSR among the study subjects for the casebooks of December 2018, January, and February 2019 was 49%, whereas for the primary data that was collected between May and July 2019 the CSR was at 64%. The CSR of 64% is almost four times higher than the 15% recommended by the WHO. The caesarean delivery rate at Mengo Hospital was high, and this was attributed to increasing caesarean delivery rates in nulliparity (primary CS), previous caesarean deliveries, and an increased number of referrals from nearby and distant clinics. The high rates were also observed by Rajabi et al.[17] In southern Iran, 2624 of 4217 deliveries were caesarean sections (62.2%). Internationally, however, the highest CSR in the world was reported from the South American sub-region at 42.9%. Similarly, Latin America and the Caribbean have a CSR share of 40.5%, while Africa has the lowest average CSR score of 7.3%, with a minimum of 3.5% in Sub-Saharan Africa and a maximum of 27.8% in North Africa.[3]

Based on RTGCS, Group 5 (nulliparous, single cephalic labor, >37 wk spontaneous labor, Group 1 (nulliparous, single cephalic labor, >37 wk spontaneous labor), and Group 3 (multiparous (without prior CS), single cephalic labor, >37 weeks of spontaneous labor) had the highest contribution to CSR; the majority of cesarean deliveries (n=211) were mothers with prior CS, single head birth, >37 weeks (group 5), followed by group 1; nulliparous, single head birth >37 weeks of spontaneous labor (n=110). Group 5 had the highest proportion (35.4%) of total cesarean births (n=627), followed by Group 1 (18.4%) and then Group 3 with (13.7%). The high contribution of Group 5 is attributed to a few cases of VBAC that were observed from the records, as well as a high number of cases of primary CS. Close monitoring of these groups of mothers, increasing the use of instrumental delivery, and practice of vaginal birth after CS can significantly reduce CSR in the study area. The fact that Group 5 women had a higher contribution to caesarean deliveries indicates the importance of preventing primary CS if a meaningful reduction in the overall CSR is to be achieved. The practice of vaginal birth after caesarean section (VBAC) for non-recurrent indications in the previous caesarean section can be applied to reduce caesarean sections in this group of mothers.[18]

The results show a greater contribution from groups 1–5 than from groups 6–10. The reason for this contribution was the large size of these groups in the population. Cesarean rates in groups 6 through 10 were higher, but the overall contribution to cesarean delivery rate was small because the sizes of these groups were smaller. The higher rate in these cases is secondary to the recommendations for delivery in these women like primiparous breech and abnormal lie.

Group 5 (women with previous scar) made the largest contribution to the overall cesarean rate (16.5%). The high rate in this group sparked debate and much criticism in the community regarding the promotion of vaginal births after cesarean section. The impression was created that there was insufficient advice for VBAC in the study area. Vaginal birth after caesarean section (VBAC) is a valid option for women with unique indications and is safe if the delivery is performed in a hospital setting (Senturk et al, 2015). In India, too, the CS rate was very high in women who had a previous CS (89.6%). Women with previous CS (Group 5) contributed at most (40.24%) to total CS; All women with breech presentations and abnormal lie delivered by CS and repeated CS contributed the most to all CS deliveries.[19] Conversely, according to[20] groups 1, 2a, and 2b. Group 1 had a CS rate of 26%, while the rates in groups 2a and 2b were 57.1% and 100%, respectively. Multiparity in a single cephalic pregnancy was observed in group 3 (spontaneous) with a CSR of 10.6%, in group 4a (induced labour) with 7.7% and in group 4b (CS before labor) with a CSR of 100% detected. Group 5, women with prior CS, had CS 86.7% of the time. Groups 1 5 together account for 79% of all deliveries. Similar studies from developing countries show that groups 1, 3 and 5 contribute the most to CSR.[21–23] In contrast, according to Poudel et al,[24] Group 1 had the highest contribution to CS. The results of this study are consistent with previous studies, which found that groups 1, 3 and 5 make the highest contribution to high CSR. A study by[25] using data from 137,094 (from 2000 to 2011) also found that the three largest groups (groups 1, 3 and 5) contributed the most to the overall cesarean rate, similar to the results of.[26]

Secondary data showed that the most common indication for cesarean delivery was a previous scar (32%), followed by obstructed labor (18%). This was due to the fact that the hospital has a high rate of primary CS and is a referral center for many elective CS, and most of them have previous scars. Although isolated oligohydramnios and twin pregnancies are also common, oligohydramnios is not an evidence-based indication for caesarean section. Therefore, rigorous auditing of the indicated case category is required because they rise the incidence of Placenta Accreta Spectrum has considerable importance, given the apparent impact of gestational implantation on the uterine scar, which is becoming

more commonplace and which can lead to postpartum hemorrhage and resultant mortality. Many would be classified as not indicated, reducing the high rate of cesarean sections. In this sense also studies from elsewhere; the caesarean section rate, its indications were calculated and grouped according to Robson's 10-group classification; The most common indications were previous caesarean section (25.4%), fetal stress (14.3%), and breech presentation (10.3%).[26,27] However, results differ from those obtained by Makhanya et al,[22] where the main indications for CS were fetal distress (36.5%) and cephalo-pelvic disproportion (26.8%).

In this study, given that impaired labor and fetal distress were the main indications for CS in Group 1 (nulliparous, simple cephalic, >37 weeks in spontaneous labor), this may be related to the problem of labor monitoring. Therefore, great attention must be paid to these factors, possibly ensuring strict criteria for CS, and considering training on the correct use and interpretation of partograph to reduce primary CS. In addition, results from primary data showed that the most common sign in the mothers who gave birth by cesarean section was a previous scar (42 (97.6%), followed by fetal distress (25 (100%)) and subsequent inhibition of labor (24 (100%)). Strategies to reduce intervention frequency should include avoidance of medically unnecessary primary CS. Improved case selection for induction and cesarean section before birth may also reduce cesarean rates. This is no different from the findings according to[28] previous caesarean accounted for 96% (p-value < 0.01) of the variation.

Based on client-related factors, the results of this study showed that having a cesarean delivery was also associated with who influenced the decision about the type of delivery, and these included husband, friends, relatives, and others (p-0.00). This could be because in African culture it is the man's choice on everything, including the mode of delivery. In the study area, it was found that mothers consulted their husbands before CS, and husband's decision was identified as one of the factors responsible for the high CS rates. In the same vein, according to.[29] The majority of women (66.5%) believed that their husbands gave consent to the caesarean section. Although the majority of women in this study were educated and in formal employment, their level of education and occupation were not associated with the occurrence of CS (P-value = 0.181 and 0.248, respectively). It was concluded that women with high socioeconomic status are more likely to accept CS as a delivery method than those with low SES, possibly because they cannot afford the cost of the procedure and because they do not understand the information available to them as well. Although there was a high level of knowledge about caesarean section and despite the high level of education of the respondents, a significant proportion of the respondents still rejected caesarean section as a delivery option. These results differ from those,[30] in whom maternal educational level (P<0.00) and location of last delivery (P<0.00) were associated with cesarean delivery. However, some previous studies on determinants of cesarean risk factor in the northern region of Bangladesh have shown that women with higher education or higher socioeconomic status were more likely to have cesarean.[31] Other studies have shown opposite results.[32]

The results of this study showed a strong association (p-0.00) between cesarean delivery and maternal desire for cesarean delivery. This is due to the limited information on CS delivery that can be provided to mothers during ANC visits. There needs to be discussion on how to deal with these women and how to provide them with sufficient information on CS issues during the ANC. Other studies have also shown that the increased cesarean rate is due to fears of litigation, a cesarean at the mother's request, and a previous caesarean.[26] In this study, the results of KI 01 (obstetricians) also indicated that fear of litigation is one of the reasons for the high rates of CS in the study area. For the same reason, previous studies have shown that a history of CS was an independent predictor of maternal desire for a cesarean section. There are maternal requests for CS at a national referral hospital in Tanzania. This was related to factors other than women's preferences, including perceived fear of child loss and events related to previous CS.[33]

In this study, the mother said that the occurrence of CS was due to the fact that health workers reduced the stress of monitoring labour work and the profit gain of the institution. This is probably because the study area is a private hospital; Therefore, the mother believed that her Cs were not necessary because of her obstetric factors, but for other institutional reasons such as profit gain, since those who were to have surgery pay more than those who give birth normally (Spontaneous Vaginal Delivery). Other mothers commented that they were not given time for their progress of labor in that they talked about being hurried to theatre. This is not different from the findings of.[34] Another reason is that some people perform CS to teach young doctors the skills to perform the procedure, and others believe that doctors do it for their own benefit and to reduce the stress of monitoring labor or any subsequent litigation that may result from this.

Methodological Strength and Limitations of the Study

Analysis of the caesarean section rate at Mengo Hospital, the factors responsible for the increase and the indications are important first steps in developing programs to reduce these rates. The main strength of this study is that it is one of the first, if not the only; study to analyze CSR based on the Robson Ten Group System Classification in Uganda. The classification helps stratify the rates into different groups, which allowed the obstetrics department to develop a rate-lowering strategy by identifying the groups that needed further evaluation. After a thorough assessment of the reasons, strategies to reduce caesarean rates must also be formulated and implemented on the basis of these analyses. The main limitation of this study is that it was conducted in one hospital, although this was chosen for its high CSR and may have introduced selection bias. Therefore, cesarean rates should not be considered representative of the entire country or all regions. In addition, this was a single-center study with referral bias, with the hospital being one of the referral units in the region. The other limitation is that the basic Robson classification identifies the contribution to the CS rates but offers no insight into the clues or explanations for the observed differences. In addition, other fetal and maternal factors that significantly affect the CS rate were not considered, such as pre-existing conditions such as hypertension and diabetes.

Conclusion

We found a high CSR in this hospital as almost every second delivery was CS. RTGCS indicated that groups 5, 1 and 3 made the highest contribution to CSR. The majority of cesarean deliveries were in mothers with prior CS, single head, >37 weeks (Group 5), followed by Group 1; Nulliparous, single cephalic, >37 weeks of spontaneous labor. The results show that group 5 had the highest proportion of the total number of cesarean deliveries, followed by groups 1 and 3. Therefore, the introduction of Robson's ten-group classification system as an auditing tool for cesarean rates is the first step in analyzing obstetric practices in a standardized way. The results of the qualitative data showed that the most important factors behind the high rates of in-hospital cesarean sections are obstetric indications for mothers. The most important obstetric factor associated with the high rates of in-hospital cesarean section was previous scarring from both primary and secondary data. There was a strong association between cesarean delivery and the mother's desire for a cesarean. From the primary data, mothers attribute the occurrence of CS to healthcare workers reducing stress in childbirth monitoring, while others said it was due to the institution's gain in profits.

Recommendations

The Robson Ten Group Classification System, an international classification system, should be adopted because of its simplicity, robustness, reproducibility, and flexibility, as well as its clinical relevance and ability to prospectively categorize women, which in turn allows for the implementation and evaluation of targeted interventions among specific groups. There is a need for close and strict supervision and monitoring of all hospitals to ensure that the CSR is within the recommended rate by WHO (10–15%).

Further Areas of Research

The TGCS is intended to be implemented in a clinic to continuously classify all deliveries and assess the monthly CS rate in each group. Continuing this classification can be very useful for Mengo Hospital to understand the causes of the increasing rate of CS. A study examining how correctly the Partograph is used and what the criteria for poor progress are important next steps. When it comes to whether women choose CS, there is a need for a qualitative study, rather than another quantitative study, to further investigate why women choose CS and whether it is beneficial for both mother and child. Further studies should investigate how the decision for CS is made on the basis of different obstetric interventions Indications/appropriateness of indication should be carried out as the decision for CS is not an art. It takes several years of practice, and even experienced obstetricians and midwives can make mistakes.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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