

## Robson Classification System for Assessment of Intra-facility Caesarean Section Rates at Morogoro Regional Referral Hospital-Tanzania

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### Abstract

**Introduction:** Caesarean section (CS) rates have drastically increased globally even among low-risk pregnant women. As a result, more mothers and babies are subjected to potential complications associated with CS. Therefore, the World Health Organization recommends different measures to address over medicalization of CS. The Tanzania DHS 2022 reports a 15% CS rate in Morogoro region. Situation at Morogoro Regional Referral Hospital (MRRH) portrays the same tendency, and necessitates the need to review the situation by classifying CS undertaken based on ten group classification by Robson and study its drivers. Therefore, this paper reports CS rates and its drivers for women who delivered at MRRH based on WHO Robson Classification, from 1<sup>st</sup> January to 31<sup>st</sup> December 2022. It also looks into routine admission and delivery data capture tools for completeness and comprehensiveness.

**Methodology:** A retrospective cross-sectional study conducted at MRRH covering all women who delivered from 1<sup>st</sup> January to 31<sup>st</sup> December 2022. Data was collected from MTUHA books number 13 and 14 for admission and delivery records from the maternity ward respectively. All patients' records admitted for delivery during the study period were extracted and entered in a standardized form. MTUHA books were reviewed and examined to identify gaps or shortcomings that might affect full classification of obstetric population based on WHO Robson classification. Data was aggregated using Robson classification report table and analyzed using

excel software, to gain meaningful insight on group size, number of CS in each group and absolute contribution of each group to overall CS rate.

**Results:** The overall CS rate at MRRH was 46.4%, significantly higher than the recommended rate of 10-15%. It was noted that 65.0% of the obstetric population served at MRRH was low-risk women, which is unexpected for a referral hospital. Based on WHO Robson classification, low-risk groups (G1, G2, G3, and G4) contributed 21.7% to the overall CS rate, suggesting potential overuse of CS interventions in these groups. Group G5 (previous caesarean section) had the highest contribution to overall CS accounting to 18.8%, indicating underutilization of trial of labour after caesarean section (TOLAC) and vaginal birth after caesarean section (VBAC). Data quality issues were identified, with small group sizes in G2 and G4 suggesting incomplete or inaccurate data capture through MTUHA books. These books do not capture information on gestation age, labor onset, lie, presentation, induction of labor or elective CS, so they are not sufficient for Robson classification.

**Conclusions:** The rate of CS at MRRH is high, with high proportion of previous CS whereby low-risk group pregnant women are unnecessarily being referred and end up with unnecessary CS. The results had improved our understanding on what could be the reason of the constantly increase in CS rates at the majority of RRHs in Tanzania. Therefore, to minimize this we recommend implementation and observation of the WHO Robson classification manual for consistent monitoring and comparison of CS rates within and across facilities and optimization of CS interventions, as well as promote VBAC or TOLAC, especially among low-risk groups.

**Key Words:** Robson classification, cesarean section rate, MRRH, MTUHA

## INTRODUCTION

Increase in the rate of deliveries by caesarean section (CS) worldwide from 7% in 1990 to 21% in 2014 has become a public health concern and cause of worldwide debates due to potential maternal and perinatal risks associated with it. These rates are higher in developed countries 27.2%, as compared to less developed countries and least developed countries accounting for 24.2% and 8.2% respectively [1].

In Tanzania, CS rate has been a subject of concern and discussion, as it is in many other countries. High CS rates can indicate potential overuse or unnecessary procedures, while low rates might suggest limited access to life saving surgical interventions [2].

As of 2021, the CS rate in Tanzania varied widely across different regions and healthcare facilities. In some urban areas and private hospitals, CS rates were relatively high, possibly due to factors like maternal request, convenience, or provider practices [2]. In rural and underserved areas, access to timely CS might be limited, resulting in lower rates [2]. Caesarean section rate in the Tanzanian population increased from 2% in 1996 to 6% in 2015 [2]. Muhimbili National Hospital (MNH) report rates of 21.8% to 49%, majority (33%) being those in low-risk group (G1 to G4) of women such as multiparas, without previous scar, with singleton, term pregnancy in cephalic presentation and spontaneous labour [3]. This is above the rate recommended by the World Health Organization (WHO) that the CS rate should ideally be around 10-15% of all deliveries [4]. This recommendation is based on balancing the benefits of CS for medical reasons against the potential risks, complications and costs associated with the procedure [3, 4].

The rate of CS in Tanzania is likely to rise due to increased accessibility of maternal services in rural settings through the expansion and improved comprehensive emergency obstetric and neonatal healthcare services at Primary Healthcare Facilities (PHC). The number of health centres in Tanzania has increased from 718 in 2015 to 1,119 in 2020, and a further increase to 1455 as reported in the 2022 National census [5,6]. Hence it is expected that pregnant women will be prone to CS as the number of health centres providing obstetric care continue to increase.

In 2022, an estimated 5236 women were delivered at Morogoro Regional Referral Hospital (MRRH), out of whom 2462 (47.0%) were delivered by CS. Data shows that there was an increase compared to 2021, where 6039 women delivered out of whom 2559 (42.4%) delivered by CS [7]. MRRH being one of the two regional referral hospitals within the region, it receives clients from all 9 administrative areas of Morogoro region. This increase can be attributed to different factors, like inadequate utilization of CS interventions in the PHCs, and over-utilization at the referral level [8].

In order to understand the drivers of this trend and to provide evidence for proposing and implementing effective measures to reduce or increase CS rates where needed, tools that guide recommendations for CS should be reviewed and strengthened. Therefore, we aimed at understanding the drivers of CS, the rate of CS and quality of maternity data capturing tools (MTUHA books) through reviewing of available datasets based on the ten group classification by Robson as adopted by the WHO. Robson Classification (also known as the Ten Group Classification) is a global standard for assessing, monitoring, and comparing CS rates both within and between healthcare facilities, over time, established by WHO in 2015 and the International Federation of Gynecology and Obstetrics (FIGO) in 2016 [1,9]. It is anticipated that the results from this study will provide scientific evidence by creating awareness among healthcare providers that will guide prioritization of targeted interventions and reduce the rate of CS with focus to improve maternal services.

## METHODOLOGY

A retrospective cross-sectional study was conducted at MRRH covering all women who delivered from 1<sup>st</sup> January 2022 to 31<sup>st</sup> December 2022. Data was collected from health information recording book “MTUHA books number 13 and 14” for admission and delivery records respectively from the maternity wards. All patients’ records admitted for delivery during study period were extracted and compiled in a master spreadsheet. MTUHA books were reviewed and examined to identify gaps or shortcomings that might affect mutual exclusivity of obstetric population classification based on WHO Robson classification manual. The proposal received ethical approval Ref No. NIMR/HQ/R.8a/Vol. IX/4479 from the National Health Research Ethical Committee. Permissions for data retrieval were obtained from MRRH management with Ref No DC.23/123/01.

Data was aggregated using Robson classification report table as described in table 1. Analysis was done using Microsoft excel data analysis software, where CS rate in each group was calculated to determine the contribution of each group to the total CS (number CS in each group divided by the total number of CS). MTUHA books were reviewed based on completeness of collected information to allow grouping of each patient in the ten group classification by Robson and gaps identified.

**Table 1:** Robson’s Ten Group Classification System.

Robson Groups	Clinical Characteristics
Group 1	Nulliparous, single, cephalic pregnancy, $\geq 37$ weeks in spontaneous labor
Group 2	Nulliparous, single, cephalic pregnancy, $\geq 37$ weeks who had labor induced or delivered before labor by CS
Group 3	Multiparous, without previous uterine scar with single, cephalic pregnancy, $\geq 37$ weeks in spontaneous labor
Group 4	Multiparous, without previous uterine scar with single, cephalic pregnancy $\geq 37$ weeks who had labor induced or delivered before labor by CS
Group 5	All multiparous with at least one previous uterine scar, with single cephalic pregnancy $\geq 37$ weeks
Group 6	All nulliparous with a single breech pregnancy
Group 7	All multiparous with a single breech including women with previous scars
Group 8	All women with multiple pregnancies including those with uterine scars
Group 9	All women with a single pregnancy with transverse or oblique lie including women with previous scars
Group 10	All women with single, cephalic $< 37$ weeks including women with previous scars

## RESULTS

As presented in the [table 4](#), a total of 5169 live birth information from January to December 2022 were aggregated and analyzed.

Table 2: Age distribution of study participants delivered by CS (N=2400).

Variable	Number (n)	Percentage (%)
Age (yrs.)		
<20	198	8.2%
20-35	1808	75.40%
>35	394	16.4%

Table 3: Drivers of CS.

Indications of Caesarian section	Frequency	Percent
Previous Scars	1042	43.4
Placenta related conditions	164	6.8
PIH, BOH, PROM, Twin pregnancy, Oligohydramnios, Polyhydramnios, Genital warts	158	6.6
Labour related conditions	559	23.3
Breech presentations	60	2.5
Non reassuring fetal status and Fetal distress	340	14.2
Not mentioned	65	2.7
Other conditions	12	0.5
Total	2400	100.0

Key:

Placenta related conditions includes; Antepartum hemorrhages, Cord accidents, Malpresentation, placenta calcification, overdue and postdate.

Labour related conditions includes; obstructed labour, cervical dystocia, prolonged labour, delayed second stage, failure of induction and feto-pelvic disproportion.

PIH-Pregnancy Induced Hypertension, BOH-Bad Obstetric History, PROM-Premature Rupture Of Membrane

### Contribution of Each of Robson Obstetric Groups to the Overall Cesarean Section Rates

Mean age of study participants who had CS was 20-35 years, making 75.4% of total. The study presented variance in obstetric population at MRRH as shown in [table 4](#). Each group indicated has a contribution to the total delivery, CS in a particular group and over all contribution of CS in the hospital. Of the total 5169 live births, 2400 women in the period under review gave birth via CS giving an overall hospital CS rate of 46.4%.

**Table 4:** Contribution of Robson Ten Obstetric Groups to Overall Caesarian Section Rate at MRRH from January 2022 to December 2022.

Robson classification Group	Number of women delivered in group (n1)	Relative Size of Robson group (%) n1/N1	Number of CS in group (n2)	Group specific CS rate (%) n2/n1	Group input to total CS (%) n2/N2	Absolute group input to overall CS rate (%)n2/N1
<b>G1</b>	<b>1619</b>	<b>31.3</b>	<b>634</b>	<b>39.1</b>	<b>26.4</b>	<b>12.3</b>
G2	56	1.1	38	67.9	<b>1.6</b>	0.7
<b>G3</b>	<b>1627</b>	<b>31.5</b>	<b>400</b>	<b>24.6</b>	<b>16.7</b>	<b>7.7</b>
G4	116	2.2	51	44.0	<b>2.1</b>	1.0
G5	994	19.2	973	97.9	40.5	18.8
G6	46	0.9	34	73.9	1.4	0.7
G7	55	1.1	28	50.9	1.2	0.5
G8	226	4.4	105	46.5	4.4	2.0
G9	15	0.3	15	100.0	0.6	0.3
G10	415	8.0	122	29.4	5.1	2.4
Total	5169	100	2400	NA	100	<b>46.4</b>

CS=Caesarean Section; N1=Total births (5169); N2=Total CS births (2400); n1= number of women in each Robson group; n2=number of CS births in each Robson group; NA= not applicable

Majority of deliveries were in the low-risk groups (G1-G4) with a total of 3415 out of 5169 (66.1%). Robson's groups 1 and 3 (G1 and G3) had high numbers of women delivered 1627/5169 (31.5%) and 1619/5169 (31.3%)

respectively. Women in Robson's group 1 (G1) which are considered to be at low risk, 634 out of 1619 (39.2%) delivered through CS.

All women in group 9 had CS i.e. group specific CS rate of 100%, however the group had the lowest input to total CS (0.6%) and lowest contribution to overall CS rate (0.3%). Women in Robson's group 5 (G5) constituted 19.2% (994/5169) of all deliveries at the hospital with a group CS rate of 97.9% (973/994). Robson's G5 was the major contributor by 18.8% (973/5169) of the overall hospital CS rate for the period under review followed by G1, 12.3% (634/5169) and G3, 7.7% (400/5169).

The most common driver for CS was multiparous women with term pregnancy, fetus in cephalic presentation and had at least one previous scar (G5). Previous scar was a reason for CS by 43.2% of all women who delivered by CS and contributed 18.8% of all CSs at the facility. Labor related complications such as obstructed labor, cervical dystocia accounted for 23.3% of all CSs followed by CSs due to non-reassuring fetal status by 14.2%. All other reasons put together accounted for 19.1% of all CSs. With this observation, a lot is desired from healthcare providers to improve VBAC and TOLAC as a method to reduce over prescription of CS.

### **Quality of MTUHA records**

We observe small size of women in group 2 and group 4(G2 &G4), contributing 1.1% and 2.2% respectively to overall delivery. This small number raises questions to the completeness of data. Some of these women might have been classified to G1 and G3 due to the size of these groups 31.3% and 31.5% respectively. G1 and G3 fall in the category of women either Nulliparous(G1) or Multipara (G3) who present with a single tone pregnancy in cephalic presentation, at term, and are in established labor, while G2(Nulliparous) and G4(Multipara) are women who present with exactly similar presentation with only one exception that they are not in established labor. Huge gap observed between the two groups with similar characteristics calls for improvement of these data capture tools.

One of the specific objectives of this study was to assess the quality of maternity data captured with MTUHA books for women delivered at MRRH. WHO-Robson classification being a robust method that mutually exclusive allow classification, categorization, analysis and comparison within and between groups as well as facilities of all data related to women who walk into maternity units for the purpose of delivery, it was of interest to understand if data captured through tools provided by the ministry of health can allow Robson classification on the point of entry. MTUHA books number 13 and 14 being the main method of Data capture were assessed for completeness and accuracy of data, such as is the recorded data comprehensive enough to allow the conduct WHO-Robson classification for every client?

Data pertaining to gestation age, onset of true labor and induction of labor could not be retrieved from admission records (MTUHA book 13). For accurate classification of women it necessitated an additional review of patient records to gather such information. This revealed a gap in the data collected as not being able to comprehensively and mutually exclusive allows classification.

## DISCUSSION

This is the first study to be conducted at MRRH to assess CS rates, with a focus on quality of data and obstetric population. The results indicate a high overall hospital CS rate with group 1 (nulliparas in spontaneous labor) and group 5 (previous CS) having high group CS rates and contributing more than other groups to the overall hospital CS rate in the period under review.

The overall hospital CS rate of 46.4% is above the WHO reference of not more than 10-15% [1]. The overall high CS rate we observed is similar in Njombe, Kilimanjaro Dar es Salaam, Ruvuma, Iringa and Dodoma regions and other studies conducted elsewhere in East Africa had an overall CS rate of 24%, the highest being in Ethiopia at 28% [6,13]. Similar study conducted at a Regional Referral Hospital in Uganda had an overall CS rate of 13.4% in a public hospital and 49% in a faith based hospital with similarity in high rates of CS among low risk group women [14,16]. This unacceptably high rate of CS at MRRH has little to do in the improvement of perinatal mortality in Tanzania which remains at 39.5 per 1,000 total births compared to 34.5 per 1,000 total births in the rest of the Eastern African region [15].

Despite, being the only public regional referral hospital serving a population of over 3.2million, and considering the number of women delivered at MRRH, the high rate of CS raises a question on their usefulness in the improvement of peri-partum outcome as compared to the WHO-MCS. Regional referral hospitals are expected to see and deliver many clients with obstetrics complications however, that does not diminish embracing good clinical practice of ruling out all the available options of a normal and low risk delivery.

The obstetric population served at MRRH is paradoxically highly composed of low-risk women G1 to G4 making more than 66% of all deliveries. This being a regional referral hospital, it was expected to see high-risk women, such as those in G5 to G10, these make about 34% of all deliveries. Similar scenario of high CS rate for low risk women was observed at a regional referral hospital in Uganda [14]. This observation may be contributed by other obstetric complications such as hypertensive disorders of pregnancy, gestational diabetes mellitus, elderly primigravida, co-morbidities, placenta abnormalities and/or those who by choice want to deliver at a regional referral hospital on private arrangements, these variables are not captured in the ten group classification system by Robson.

The observed CS rate is highly contributed by low-risk women that belong to G1-G4 by 21.7%. These are women who are either nulliparous or multiparous with singleton, term pregnancy, in cephalic presentation with or without spontaneous labour. In this low-risk group (G1), the overall contribution to CS is deemed high above 10-15% as suggested by WHO [4]. These results are similar to other related studies conducted in Uganda and Ethiopia [11,14].

**Table 5:** CS rate at MRRH and the WHO Multi-Country Survey (WHO-MCS) reference population.



GROUP	Group Description	MRRH CS Rate		WHO-MCS Reference population (41,203) CS Rate	
		Group specific CS rate (%)	Group input to overall CS rates (%)	Group CS rate (%)	Group input to overall CS rates (%)
1	Nulliparous, single, cephalic pregnancy, $\geq 37$ weeks in spontaneous labor	39.1	12.3	9.8	2.9
2	Nulliparous, single, cephalic pregnancy, $\geq 37$ weeks who had labor induced or delivered before labor by CS	67.9	0.7	39.9	3.5
3	Multiparous, without previous uterine scar with single, cephalic pregnancy, $\geq 37$ weeks in spontaneous labor	24.6	7.7	3.0	1.2
4	Multiparous, without previous uterine scar with single, cephalic pregnancy $\geq 37$ weeks who had labor induced or delivered before labor by CS	44.0	1.0	23.7	1.5
5	All multiparous with at least one previous uterine scar, with single cephalic pregnancy $\geq 37$ weeks	97.9	18.8	74.4	5.3
6	All nulliparous with a single breech pregnancy	73.9	0.7	78.5	0.9
7	All multiparous with a single breech including women with previous scars	50.9	0.5	73.8	1.1
8	All women with multiple pregnancies including those with previous scars	46.5	2.0	57.7	0.5
9	All women with a single pregnancy with transverse or oblique lie including women with previous scars	100.0	0.3	88.6	0.3
10	All women with single, cephalic $< 37$ weeks including women with previous scars	29.4	2.4	25.1	1.0
<b>Total</b>		NA	<b>46.4</b>	NA	<b>18.5</b>

**Table 5** compares CS rate between MRRH and WHO MCS reference population, this show that repeat CS are the main drivers for observed CS rate in both groups. MRRH has high rates especially in G1 and G3 and relatively less contribution in provider initiated births (G2&G4) when compared to similar groups in the reference population[19]. However, the relatively high CS rate in low risk groups often suggests inappropriate use leading to a need of in-depth studies to establish the root cause and drivers of CS among low-risk mothers [11]. Considering robustness, reproducibility, simplicity and its clinical relevance, the ten group classification by Robson is likely to assist in identifying the obstetric population that unreasonably contribute to the high CS rate [16]. Therefore, monitoring these specific groups will permit implementation and optimization of interventions that might lead to reduction of un-indicated CSs and improvement of perinatal outcomes.

Large G5 size gives a glimpse of high prescription of CS interventions in previous years. In this case, G5 is the highest contributor to overall CS at MRRH by 18.8%. A group CS rate of 98% informs that there is under use of VBAC and TOLAC services in this particular group. These findings are over and above rates observed at a tertiary level hospital in Northern Tanzania, which reports a repeat caesarean section rate of 52.5% [17]. Proper evaluation and close monitoring of women who present in labor with a previous scar is recommended, this will allow for VBAC and/or TOLAC for women and reduce the number of un-indicated repeat CS. Further research



for benefits of VBAC and repeat RCs is recommended in a study done in South Asia and Latin America low and middle income setting where VBAC and repeat CS benefits and complications could not be established statistically [18].

Data quality is another domain that was studied. Small size of G2 and G4 points to inadequacy in the accuracy and completeness of data capture tools as well as practices of providers (MTUHA books 13 and 14) at the point of data entry. This gives limited information on patients who have their labor induced or who request/scheduled for elective CS, hence these women might be categorized in either G1 or G3 as if they presented in labor because G2 and G4 are disproportionately small (1.1% and 2.2%) compared to their counterparts in G1 and G3 (31.3% and 31.5%). MTUHA 13 and 14 tools do not capture important information about fetal lie, presentation, status of labor or gestation age on admission, this information was obtained based on birth weight and supplementary information from Partograph and patient notes hence data quality may be tempered with.

### **CONCLUSIONS**

Majority of the obstetric population attending the MRRH being low-risk points to the need for optimization of intrapartum care at all levels of maternity care and strengthening the referral system. Overall CS rate is above WHO recommendation (10-15%) and the rates are high in low-risk groups which points to the possibility of over-prescription of CS. We, therefore, recommend the adoption of the WHO-Robson classification system, revision of MTUHA books for admission and delivery records be adapted to include the capture of information for Robson classification at the point of entry and build capacity of health care providers to optimize primary and repeat CS interventions and employ VBAC and TOLAC as part of intrapartum care, especially among low-risk groups.

### **LIMITATION OF STUDY**

Inability of MTUHA books to capture information on labor onset, induction of labor, elective CS, gestation age, presentation, lie as well as inability of Robson classification manual to capture pregnancy complications such as hypertensive disorders, gestation DM, placenta abnormalities and severe anemia may be the reason for small size of G2 and G4. This may affect the conclusion that many CS interventions are done on low risk group because these confounders were not considered in the MTUHA books as well as in Robson Classification.

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### **CONFLICT OF INTEREST**

I hereby declare that there are no conflicts of interest related to this research. I have no financial, personal, or professional relationships that could be perceived as influencing the outcomes of this study. All findings and conclusions presented are based solely on the research conducted.

**Intended use of the study result:** Study findings inform quality of care, as any CS rate above 10% is not associated with a reduction in maternal and new-born mortality rate according to WHO1. These findings also inform on the comprehensiveness of data capture tools as well as how MRRH CS data relate to WHO-MCS data and suggest best practices for effective data use.

This study allows MRRH to understand the obstetric population that it serves. This information is vital, to understand the rates of CS among low and high risk groups as well as inform issues of vaginal birth after caesarean section (VBAC) or trial of labour after caesarean section (TOLAC). The study improved awareness of the tendency of what is visible as an increase in CS rates at the majority of RRHs in Tanzania and what it means to the community and Nation at large in terms of quality of care and factors associated with CS.

Raise awareness among healthcare providers about the optimal CS rate and its impact on perinatal outcomes.

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