ASSESSMENT OF CAESAREAN SECTION TREND IN TERTIARY LEVEL HOSPITALS OF BANGLADESH BY USING ROBSON'S TEN GROUP CLASSIFICATION SYSTEM-A MIXED METHOD STUDY

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Acknowledgement

All praise for almighty alone the most merciful and the most compassionate and the holy prophet Hazrat Muhammad(P.B.U.H),the most perfect among & of the ever born on the surface of the earth, which is forever a torch of guidance & knowledge of the humanity.

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Declaration

I hereby declare that the work described in this thesis with the title "Assessment of Caesarean Section trend in Tertiary level hospitals of Bangladesh By Using RTGCS-A Mixed Method Study'' carried out under my supervision in fulfilment of the requirement for the award of the degree of Masters in Public health, School of Pharmacy and Public Health, Independent University of Bangladesh has been carried out by me for the degree of Masters in Public health. I also hereby declare that the whole substance of this research has neither been submitted elsewhere nor has it been concurrently submitted for any degree.

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Certificate

It is certified that the work contained in this research thesis "Assessment of Caesarean Section trend in Tertiary level hospitals of Bangladesh By Using RTGCS-A Mixed Method Study'' carried out under my supervision in fulfilment of the requirement for the award of the degree of Masters in Public health, School of Pharmacy and Public Health, Independent University of Bangladesh.

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Contents

LIST OF ABBREVIATIONS

AVD	Assisted Vaginal Delivery(forceps,ventouse).
BEmONC	Basic Emergency Obstretic and Newborn Care.
CEmONC	Comprehensive Emergency Obstretic and Newborn Care.
CMC	Chittagong Medical College.
CoxMC	Cox'sbazar Medical College.
CS	Caesarean Section.
DH	District Hospital.
MO	Medical Officer.
NVD	Normal Vaginal Delivery.
RTGCS	Robsons Ten Group Classification System.
SSN	Senior Staff Nurse.
TOLAC	Trial of labor after CS.
VBAC	Vaginal birth after CS.
VD	Vaginal Delivery.

LIST OF TABLES

List of Figures

Title of the Study

ASSESSMENT OF CAESAREAN SECTION TREND IN TERTIARY LEVEL HOSPITALS OF BANGLADESH BY USING ROBSON'S TEN GROUP CLASSIFICATION SYSTEM-A MIXED METHOD STUDY.

Abstract

Background:

Cesarean section (CS) is a widely recognized major obstetric surgery and one of the oldest procedures in abdominal surgery. It involves delivering the newborn and the placenta through an abdominal wall incision (laparotomy) and a uterine incision (hysterotomy). The global CS rates have shown a concerning increase over the last two decades. In 2017, the World Health Organization (WHO) and the International Federation of Obstetrics and Gynecology (FIGO) endorsed the Robson Ten Group Classification System (RTGCS) as the global standard approach for evaluating, monitoring, and comparing CS rates. This study aims to evaluate the effectiveness of RTGCS in optimizing cesarean section rates in tertiary level hospitals and to identify potential challenges encountered by healthcare providers during the implementation of the Robson Ten Group Classification.

Method:

A mixed-method study was conducted at two tertiary hospitals in Bangladesh. The quantitative data were collected from various hospital records, including inpatient case records, delivery room register records, operation theatre register records, and EmONC register for all women who delivered between July and December 2022. The overall cesarean section (CS) rate was calculated, and the women were then classified into one of the ten Robson groups. The study analyzed the relative size of each group, their contribution to the overall CS rate, and the CS rate within each group.

Result:

A total of 2587 deliveries were analyzed. Of these,1304 women delivered by CS with a collective CS rate of 50.9%.The largest contributors to the overall CS rate were Group 5 (18.2%), Group 1(9.8%),Group 3(7.9%),Group 4 (4.5%),group 2 (4.3%).The leading challenges for implementing RTGCS are lack of adequate training,lack of monitoring and supervision and HR gap.

Conclusion:

Through implementation of the Robson ten group classification system, we identified the contribution of each group to the overall CS rate as well as the CS rate within each group. Group 5 was the leading contributor to the overall CS rate. This study also revealed a high rate of CS among low-risk groups. These target groups require more in-depth analysis to identify possible modifiable factors and to apply specific interventions to reduce the CS rate. Addressing the challenges, evaluation of existing management protocols and further studies into indications of CS and outcomes are needed to design tailored strategies and improve outcomes.

Keyword: Robsons Ten group Classification System, Caesarean Section, Bangladesh

Chapter 1: Introduction

Introduction

Cesarean section (CS), one of the most well-known major obstetric surgeries, has a long history and is considered one of the oldest operations in abdominal surgery (1–3). It involves the delivery of the newborn and placenta through an incision made in the abdominal wall (laparotomy) and uterus (hysterotomy), followed by suturing of the uterine and abdominal wall layers (1,4).

Access to comprehensive emergency obstetric care, including cesarean section, is crucial in order to prevent the estimated 287,000 maternal and 2.9 million newborn deaths that occur annually worldwide (5).

However, the timing of CS delivery is crucial, as failure to conduct the procedure in a timely manner can result in various complications such as perinatal asphyxia, stillbirth, uterine rupture, or obstetric fistula, which is indicative of exceptionally prolonged and obstructed labor (2,4,6–9).

than those associated with normal vaginal deliveries (1,9). Maternal complications associated with CS can be categorized as short-term and long-term complications (4). Short-term postoperative complications include bleeding and wound infections, which are the most common and critical surgical complications that may lead to prolonged hospitalization, pain, and postoperative infections (in 3%-15% of patients) such as urinary tract injury, laceration cellulitis, pelvic cellulitis, and endometritis(1–9). On the other hand, long-term postoperative complications, such as wound subcutaneous abscess, may manifest approximately 22 days after surgery, while others, like pelvic abscess and thromboembolic complications such as deep venous thrombosis (DVT), may take longer to develop (3,4,6–9). It has observed that the incidence of DVT is three to five times higher after CS compared to vaginal delivery (1–10). In certain settings, maternal mortality rates associated with CS have found to be 2-4 times greater

CS delivery also poses risks and complications for the newborn (1). Infants delivered by elective CS have an increased risk of transient tachypnea and pulmonary hypertension compared to those born vaginally (1,11). Moreover, CS deliveries contribute to increased maternal mortality, maternal and infant morbidity, and post-delivery complications, resulting in significant financial implications (1). These factors raise concerns about the appropriateness of performing CS in cases where it may not be medically necessary (3).

Globally, there has been an alarming increase in CS rates over the past 24 years, with the rate rising from 6% in 1990 to 19% in 2014, although there are disparities among continents, countries (both developed and developing), and diverse types of hospitals (private, government, teaching) (4,7). The rising CS rates can be attributed to several factors, including increases in maternal age, BMI, and changes in obstetric practices and technologies (2,6). In addition, CS requests from mothers and concerns among healthcare providers about litigation have become common indications for performing the procedure (8).

Bangladesh is no exception to the global trend of increasing CS rates (2). The country has experienced a substantial rise in CS rates, with the prevalence increasing more than eight-fold, from 2.7% in 2000 to 24% in 2014 (9,12).

Various factors have been hypothesized to contribute to this trend in Bangladesh, including high rates of adolescent (35%) and late-aged pregnancies (5%), improved household, educational, and socioeconomic status, as well as financial incentives of hospitals and doctors for performing CS (6,7,12). Some reasons cited by health workers for the increasing rate of cesarean sections (CS) include the convenience of time allocation and the desire to avoid complications or potential medical litigation resulting from the vaginal delivery process (10).

The rising prevalence of CS globally has become a matter of immediate concern and warrants serious international attention (3,4,7–9). Although recent advancements in anesthesia, antibiotics, antiseptic techniques, aseptic techniques, blood transfusion facilities, and safe surgical practices have reduced the morbidity and mortality rates associated with CS, the procedure still carries risks (1,6,9,10). Therefore, careful judgment is necessary in determining which cases warrant a CS, and the World Health Organization (WHO) recommends a consensus rate of 10%-15% (1,3,4,6,7,10–21).

According to the WHO, when CS rates increase above 10% and up to 30%, there is no observed impact on mortality rates (1,2,5,6). However, the data available does not allow us to assess the link between maternal and newborn mortality and CS rates exceeding 30% (5).

Nevertheless, recent data from 150 countries indicate that the average CS rate is 19%, ranging from a high of 40% in Latin America to a low of 7% in the African region (20). In Bangladesh, the CS rate has increased from 12% in 2010 to 31% in 2016, according to the Bangladesh Maternal Mortality and Health Care Survey (BMMS) (22).The most recent data from the Bangladesh Demographic and Health Survey (BDHS) in 2021-2022 shows that the CS delivery trend is 45% in Bangladesh, significantly higher than the global standard (23).

The Sustainable Development Goal 3 (SDG-3) aims to reduce neonatal mortality to below 12 per 1000 live births, under-5 mortality to below 25 per 1000 live births, and the global maternal mortality ratio to less than 70 per 100,000 live births (24). However, in Bangladesh, the neonatal mortality rate is 23 per 1000 live births, the under-5 mortality rate is 38 per 1000 live births, and the maternal mortality ratio is 173 per 100,000 live births in 2017, making it challenging to achieve these goals (23). The increasing trend in CS deliveries could pose a barrier to achieving these targets (2). Additionally, the socioeconomic disparities in CS service utilization raise concerns about whether the right women are receiving appropriate care at the right time (20).

To understand the driving factors behind the increasing trend of CS and implement effective measures to reduce or increase CS rates as needed, it is essential to have a monitoring and comparison tool for CS rates in the same setting over time and between different settings (10,19). Traditional monitoring of CS rates at the facility level using the overall percentage of deliveries by CS is challenging to interpret and compare due to differences in hospital factors, obstetric population characteristics, and clinical management protocols (17–19) Therefore, a classification system is necessary to monitor and compare CS rates in a standardized, reliable, consistent, and action-oriented manner (18).

In 2011, the WHO conducted a systematic review that identified 27 different systems for classifying CS based on various criteria (18). In 2017, key stakeholders, including the WHO and the International Federation of Obstetrics and Gynecology (FIGO), endorsed the use of the Robson Ten Group Classification System (RTGCS) as global standard for assessing, monitoring, and comparing CS rates (19). The RTGCS categorizes all deliveries into ten distinct and inclusive groups based on five simple obstetric parameters, without considering the specific indications for CS (16,17). It is considered easy to implement and provides a comprehensive overview of CS rates (19). Table 1 (11,16,18,20) demonstrates the groups in the RTGCS based on their inclusion and exclusion criteria.

TABLE 1 ROBSON 10 GROUP CLASSIFICATION SYSTEM

Group 1	Nulliparous, single cephalic, ≥ 37 weeks, in spontaneous labour
Group 2 2a 2b	Nulliparous, single cephalic, ≥ 37 weeks, induced or CS before labour Nulliparous, singleton, cephalic, ≥ 37 weeks gestation, induced labour. Nulliparous, singleton, cephalic, ≥ 37 weeks gestation, cesarean section before labour.
Group 3	Multiparous (excluding previous cesarean section), singleton, cephalic, ≥ 37 weeks gestation, in spontaneous labour.
Group 4 4a 4b	Multiparous without a previous uterine scar, with singleton, cephalic pregnancy, ≥ 37 weeks' gestation, induced or caesarean section before labour. Multiparous without a previous uterine scar, with singleton, cephalic pregnancy, ≥ 37 weeks' gestation, induced labour. Multiparous without a previous uterine scar, with singleton, cephalic pregnancy, ≥ 37 weeks gestation, cesarean section before labour.
Group 5	Previous caesarean section, singleton, cephalic, ≥ 37 weeks gestation.
Group 6	All nulliparous with a single breech.
Group 7	All multiparous with a single breech (including previous caesarean section).
Group 8	All multiple pregnancies (including previous caesarean section).

Group 9	All women with a single pregnancy in a transverse or oblique lie (including those with previous caesarean section).
Group 10	All singleton, cephalic, < 37 weeks' gestation pregnancies (including previous caesarean section).

The first column of the table1,describes the different groups identified by the Robson Ten Group Classification System (RTGCS). These ten groups were selected to provide meaningful differentiation within the population, as having more than ten groups would be difficult to remember (6). The chosen groups have clinical relevance and some are designed to assist in assessing data quality (15). The order and relationships of the groups in the table are also significant as they facilitate quick and easy interpretation of the data (14,15).

In Bangladesh, the adoption of RTGCS has been limited to a few healthcare institutions (5). Consequently, there are only a few publications available on RTGCS in the country. The national action plan for promoting normal vaginal delivery and preventing unnecessary cesarean sections in Bangladesh includes a recommendation for integrating RTGCS into the national health program (5). This intervention has been included in various operational plans under the 4th sector program (HNPSP), and all relevant partners have committed to supporting this initiative (5).

In 2021, the Maternal, Neonatal, Child, and Adolescent Health (MNC&AH) program of the Directorate General of Health Services (DGHS) invited USAID's MaMoni MNCSP to assist in developing a training manual and building the capacity of selected providers in implementing the Robson Classification (5).As part of the implementation plan, RTGCS has been introduced in different tertiary level public and private hospitals across Bangladesh (5). "*Monitoring cesarean births using the Robson Ten Group Classification System: A cross-sectional survey of private for-profit facilities in urban Bangladesh"* (20) is the only published study conducted to date on the implementation of RTGCS in Bangladesh.

Therefore, this study represents a significant milestone in quantifying the role of RTGCS in reducing unnecessary cesarean sections and understanding the challenges associated with its application in tertiary level hospitals in Bangladesh. The purpose of the study is to assess the effectiveness of RTGCS in optimizing the cesarean section rate in tertiary level hospitals and to identify the potential challenges faced by healthcare providers in implementing the Robson Ten Group Classification. The findings of this study will inform decision-makers and guide appropriate actions.

Chapter 2: Research Question and Objectives

Research Question:

- Can we asses Caesarean Section trend in tertiary level hospitals of Bangladesh by using Robson Ten Group Classification Systems?

Hypothesis:

- Robson Ten Group Classification Systems is an useful tool for
- assessing the Caesarean section trend in tertiary level hospitals of Bangladesh.

Objectives :

General Objectives :

- To analyze the delivery trend based on Robson 10 group Classification system.

Specific Objectives :

- To see absolute group contribution of Robson Ten Group Classification in overall caesarean section of the facilities.
- To compare the Caesarean section rate and normal vaginal delivery rate before and After using Robson ten group Classification.
- To explore the challenges faced by service providers during the implementation of RTGCS.

Chapter 3 :Methodology

Methods/Materials

3.1 Study design:

The study is a mixed method Study.Both Qualitative and Quantitative method are applied to meet the objectives of the study.

TABLE 2 OBJECTIVES OF THE STUDY

	Type of study	Tools	Participants
Objective-1	Quantitative (Cross-sectional study)	EmONC register,NVD and operation theatre register,weekly admission review .	Pregnant women admitted in Hospitals for obstretic outcome.
Objective-2	Quantitative	Monthly report of EmONC services	Asst. register, Nursing InCharge, Statistician
Objective-3	Qualitative	In depth interview	Service providers(Medical Officer,SSN)
		Key Informant Interview	Head of the department (gynae and Obs.)
		FGD	SSN,MO

3.2 Study setting:

There are 37 Govt. Medical Colleges and 62 district hospitals in Bangladesh except Rajshahi District and Dhaka District. The national action plan for the promotion of normal vaginal delivery and prevention of unnecessary C-sections in Bangladesh includes a recommendation for the adoption of RTGCS into the national health program. Accordingly, this intervention has been included in various operational plans under the 4th sector program (HNPSP). OGSB with the technical support from USAID's MaMoni MNCSP project initially started training for RTGCS in 17 Government and private medical college and district hospitals.Later on additional 19 hospitals had been added for the RTGCS implementation.Among the 17 medical college and district hospitals Chittagong medical college and Cox'sbazar Medical college hospitals have significant importance. The study is conducted in Chittagong medical college- a well

renowned tertiary level teaching hospital of Bangladesh and 250 bedded district Sadar hospital Cox'sbazar "A study on Examining the Efficacy of the Robson Classification System for Optimizing Cesarean Section Rates in South Asia" was conducted in 2019 and Chittagong Medical college represent Bangladesh on that study (15).So, we purposively selected this medical college as a pioneer hospital for RTGCS implementation in Bangladesh. And Cox'sbazar DH is one of the most privileged district hospital in Bangladesh due to huge financial, HR and infrastructure support from World bank and many other UN and INGOs as a part of supporting Rohingya response .We purposively selected the hospital for it's exceptional characteristics. Although ,One is district level facility cum Medical College hospital and the other one is a divisional level facility but both are teaching and referral hospitals.

3.3: Source of data:

a)Quantitative data source:

This cross-sectional study investigate six variables (Parity, Gestational week,P/H/O CS,Onset of labor,Fetal presentation and number of fetus), which are required for robson ten group classification system) using inpatient case records, delivery room register records, operation theatre register records, EmonC register.

b)Qualitative data Source:

In depth Interview of the service providers(medical officers, SSNs and Midwives),KII (Head of the department ,gynae and obs, Assistant professor ,consultant) and two FGDs (one with for to six SSN and another one with four to six Medical officers). IDI and KII open the scope of informal discussion or conversation that helps to grasp the whole scenario of responses. On the other hand, FGD gives us the platform to have more structured conversation involving a group of people from where we can get a comprehensive picture on a particular issue. A thematic guideline was developed to follow the process with important probing during interview and discussion.

3.4 Study Population:

The study population included all pregnant women who have been admitted in the hospital for delivery outcome and gave birth in the hospital except referred out cases before delivery outcome , DORB,Abscondend and

DOR patients before delivery. Also delivery cases prior 28 weeks of gestation had been excluded from the study population.

3.5 Sample:

a) Quantitative sample:

Quantitative Sampling technique:

In Chittagong medical college there are five units in Gynae and obs department. Due to time and financial constrain, we randomly selected one unit among five and collect data of all pregnant women who gave birth after viable age of pregnancy in that unit from October to December 2022. In 250 bedded district sadar hospital ,Cox'sbazar we collected data of all pregnant women who gave birth after viable age of pregnancy in that unit from October to December 2022.
For both hospitals, total number of NVD and CS were collected from July 2022 to December 2022.

Quantitative Sample size :

Total Sample size - 2587
From Chittagong Medical College - 701
From 250 Bedded District Sadar Hospital Cox'sbazar- 1886

Quantitative sample Inclusion and exclusion criteria:

We excluded laparotomy done for uterine rupture, abortion and deliveries before fetal viability. In the Bangladeshi context, viability is considered after gestational age of 28 weeks or birth weight ≥ 1, 000 g, if gestational age is unknown.

b) Qualitative Sample:

Qualitative Sampling Technique:

For Qualitative sampling researcher purposively selected Cox'sbazar medical college hospital for easy access and convenience. After discussing with head of the department,Gynae and Obs. We selected the respondents who got training,know details about Robsons Ten Group Classification system and are closely related with RTGCS reporting.

Qualitative Sample Size:

- Three KII : Head of the department Gynae and Obs, one Assistant Professor and One Consultant in CoxMC
- Six IDI : Three Medical Officer, Three SSN in CoxMC.
- Two FGD: Four to Six SSN in one group and four to six MO another group.

3.6 Duration of Study:

July 2022 to July 2023.

3.7 Data collection tool:

Quantitative data collection tool :

An excel data sheet has been used for the variables information collection required for robsons ten group classification system to classify the quantitative samples . It included Age,parity,gestational weeks,number of fetus, fetal presntation,previous history of CS, onset of labor,mode of delivery,indication of CS from both hospitals.

Qualitative data collection tool:

Thematic qualitative guideline was developed for individual responders of IDI and KII.Mobile phone recorder,pen and paper will be used as data collection tool for IDI,KII.

3.8: Data Collection Technic:

a) Quantitative data collection technic :

The researcher had visited the hospitals gynae and obstretics ward.collect and review the inpatient case records, delivery room register records,operation theatre register records, EmONC register and use the preform excel sheet to collect the information of required variables.

b)Qualitative data collection technic:

The researcher collected qualitative data from 250 bedded district sadar hospital, Cox'sbazar. After purposive selection in person visit and approach face to face thematic semi structured interview for KII (Head of the department, Assistatnt professor and Consultant of Gynae and Obstretics department) and IDI (Medical Officer,SSN). With thematic guideline probing will done where required.

3.9: Data analysis Plan:

a)Quantitative data analysis:

Data entry and analysis is performed using SPSS version 26.0.The Robson TGCS is comprised of six major variables—parity, onset of labour (spontaneous or induced), gestational weeks, fetal presentation, number of fetuses, previous caesarean delivery. These variables are used to group delivered women into ten obstetric groups. Analysis of these groups considers the following measures: 1) “Relative size of the group” based on the number of women in each group divided by total number of women giving birth; 2) “Group specific CS rate” which is the CS divided by the number of women in each group; 3) “Group contribution to total CS rate” or the number of CS over the total number of women undergoing caesarean; and, 4) “Group contribution to overall CS rate” which is the number of CS over the total number of women giving birth. Due to manual data entry in public hospitals without proper data personnel, data quality was a concern. For this reason, reference values from WHO robson manual were used to validate the relative size of the each Robson group .Monthly hospital EmONC report is analyzed to observe the total number of delivery,number of CS and VD before and after using RTGCS.

b)Qualitative data analysis :

After data collection ,summery note and verbatim identification was done within 24hrs of data collection. Word to word translation was not done but thematic analysis was conducted after individuals response summarization.

3.10 Data security:

Data security was maintained by preserving the hard copies in a drawer with lock and key . Individual Password was given to the specific folder in laptop for data security purposes.

3.11 Ethical Clearance:

The study was approved by the Institutional Review Board from Independent University of Bangladesh and local study centers. This study was conducted in accordance with Good Clinical Practice.

3.12: Conflict of interest:

There is no conflict of interest declared by the research team during conducting the study.

Chapter 4 : Results

Results:

Quantitave results:

4.1 Characteristics of Pregnant Women who gave birth in the Hospitals :

Over the Study period (October 2022 to December 2022) A total of 2587 (CMC unit 1-701,CoxMC-1886) women delivered in the two participating hospitals. Of these,1304 women delivered by CS(CMC Unit1-345,CoxMC-959) with a collective CS rate of 50.9% (CMC 51%,CoxMC 50.8%) and1283 women delivered by Vaginal delivery (CMC Unit 1-356,CoxMC-927).Nine women were excluded for pre viable deliveries. Thus a total of 2578 deliveries were analyzed.
Some characteristics (age of the mother,Parity,gestational age,number of fetus,fetal presentation,previous history of CS) of the cases has been described in figure 1-3 and table 3.

Age of the mother :

Among 2578 cases, age was recorded for 2445 pregnant women, and for 133 cases, the age of the mother was missing in the record. In figure 1, the frequency and percentage distribution of age of the mother has been shown.

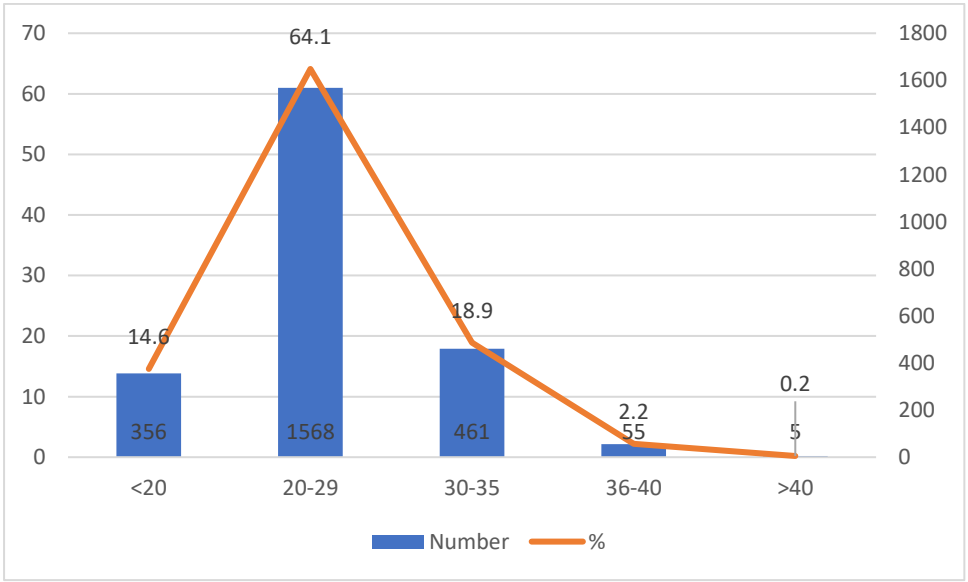

FIGURE 1 FREQUENCY AND PERCENTAGE DISTRIBUTION OF AGE OF THE MOTHER

The age of the mothers is categorized into five age ranges:

1. Adolescent (Below 20 years): 356 cases, contributing 14.6%.
2. 20-29 years: 1568 cases, contributing 64.1% (the highest contributing age group).
3. 30-35 years: 461 cases, contributing 18.9%.
4. Advanced maternal age (36-40 years): 55 cases, contributing 2.2%.
5. High-risk maternal age (above 40 years): 5 cases, contributing 0.2%.

Parity :

Among 2578 cases, information of [arity is missing in 2 cases in the record. In figure 2, frequency and percentage distribution of para has been shown.

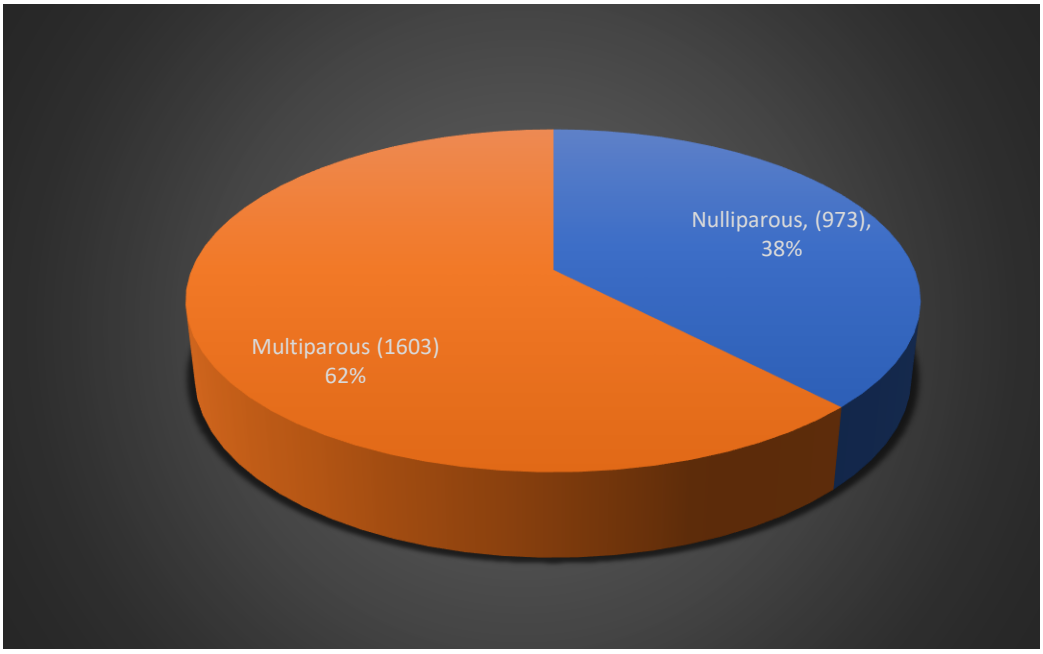

FIGURE 2 FREQUENCY AND PERCENTAGE DISTRIBUTION OF PARITY AMONG PREGNANT WOMEN

According to figure 2, around 62% cases are multiparous and 38% cases are nulliparous.

Number of Fetus:

In Figure 3,the frequency and percentage of number of fetus has been shown.

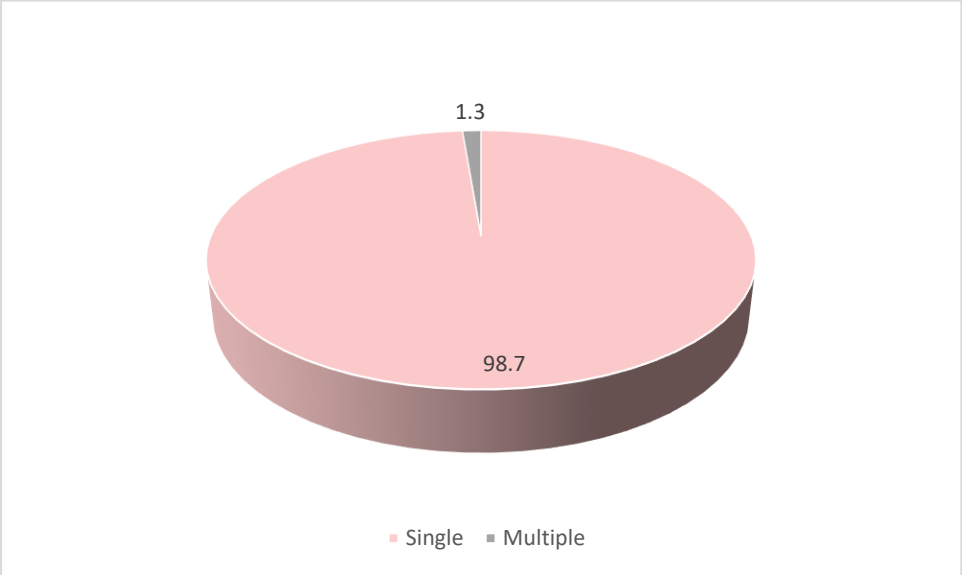

FIGURE 3 FREQUENCY AND PERCENTAGE OF NUMBER OF FETUS

In Around 98.7% cases there are single fetus and in 1.3% cases we found multiple fetuses.

In Table 3, the frequency and percentage distribution of other variables for RTGCS like gestational weeks, previous history of CS, fetal presentation has been demonstrated. Among 2578 cases, in the record information about gestational age was missing for 9 cases, Previous history of CS was missing for 29 cases and fetal presentation was missing for 273 cases (Table 3).

TABLE 3 FREQUENCY AND PERCENTAGE DISTRIBUTION OF VARIABLES

Character	Frequency	Percentage
Gestational Age(weeks)		
28-36	453	17.6
>=37	2116	82.4
Total	2569	100
Data missing	9	
Previous history of CS		

No Previous history of CS	1985	77.9
Atleast 1 previous history of CS	564	22.1
Total	2549	100
Data missing	29	
Fetal presentation		
Cephalic	2199	95.4
Breech	87	3.8
Transverse or Oblique	19	0.8
Total	2305	100
Data missing	273	

4.2 Robson 10 Group Classification and overall Contribution to CS:

In Table 3,Robson group wise patient distribution (frequency and percentage) has been shown for both hospitals. Out of 2578 case records, 116 cases were discarded since these deliveries were not classified as RTGCS classification system were missing for those cases in the hospitals database. Total sample included for analysis was 2462 birth events.

In CMC (unit 1) , Group1 (27.5%),Group 3(24.6%),Group 5(18.5%) and Group 10(16.5 %) are 4 highly contributing groups respectively (Figure 4).

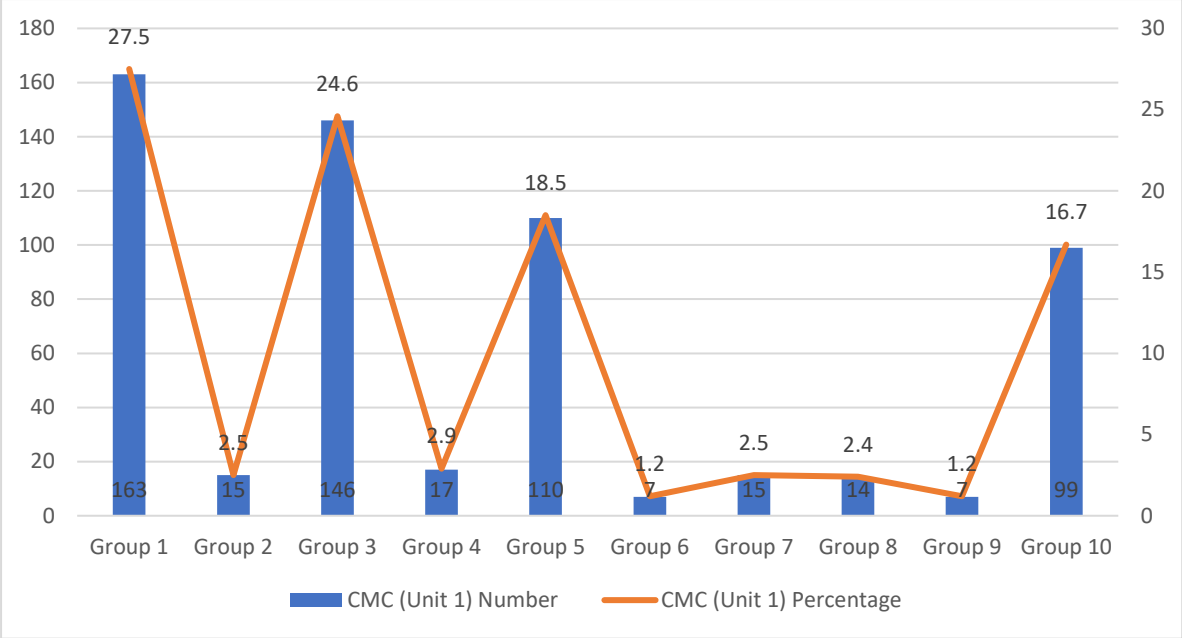

FIGURE 4 RTGCS GROUP WISE PATIENT'S FREQUENCY AND PERCENTAGE DISTRIBUTION IN CMC UNIT 1 FROM OCTOBER 2022 TO DECEMBER 2022.

For CoxMC, Group 3(28.2%), Group 1(26.4%), Group 5(19.0%) , Group 10(11.4%) are 4 highly contributing groups (Figure 5).

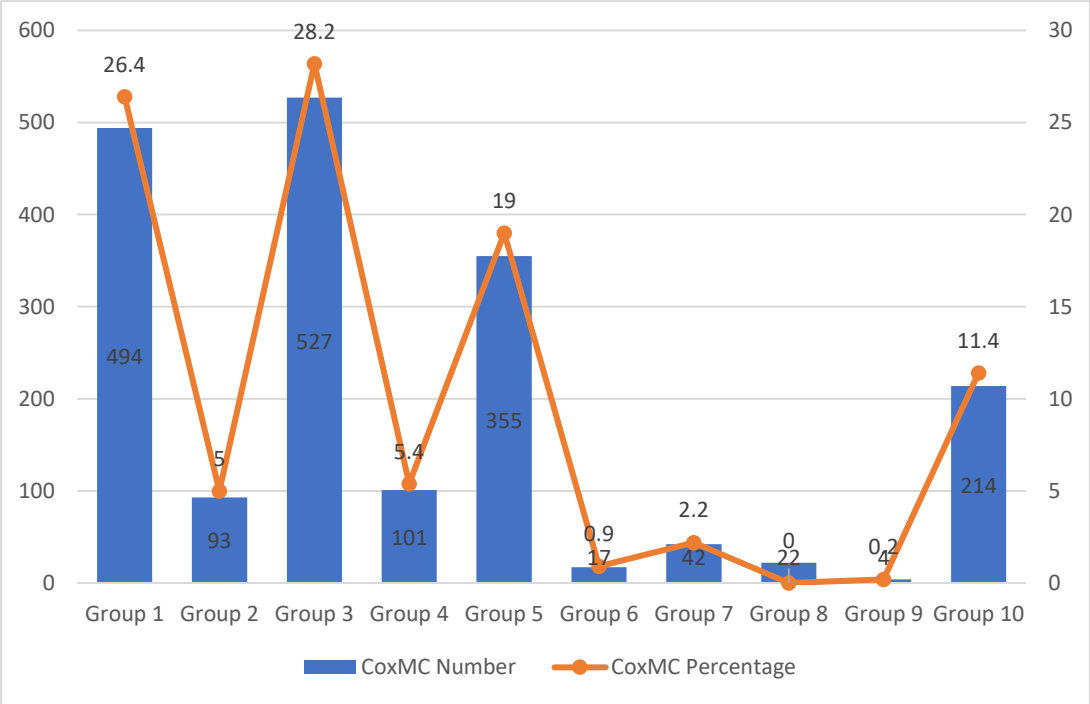

FIGURE 5 RTGCS GROUP WISE PREGNANT WOMEN FREQUENCY AND PERCENTAGE DISTRIBUTION IN COXMC FROM OCTOBER 2022 TO DECEMBER 2022

Figure 6 illustrates the overall frequency and percentage of Pregnant women according to RTGCS grouping in both hospitals . Total 675 cases(27.3%) are in Group 3 (Multiparous,excluding previous cesarean section, singleton, cephalic, ≥ 37 gestational weeks , in spontaneous labour) which is highest contributing group. Group 1 (26.7%), group 5 (18.9%) and group 10(12.7%) are the second,third and fourth contributing group respectively(figure 6).

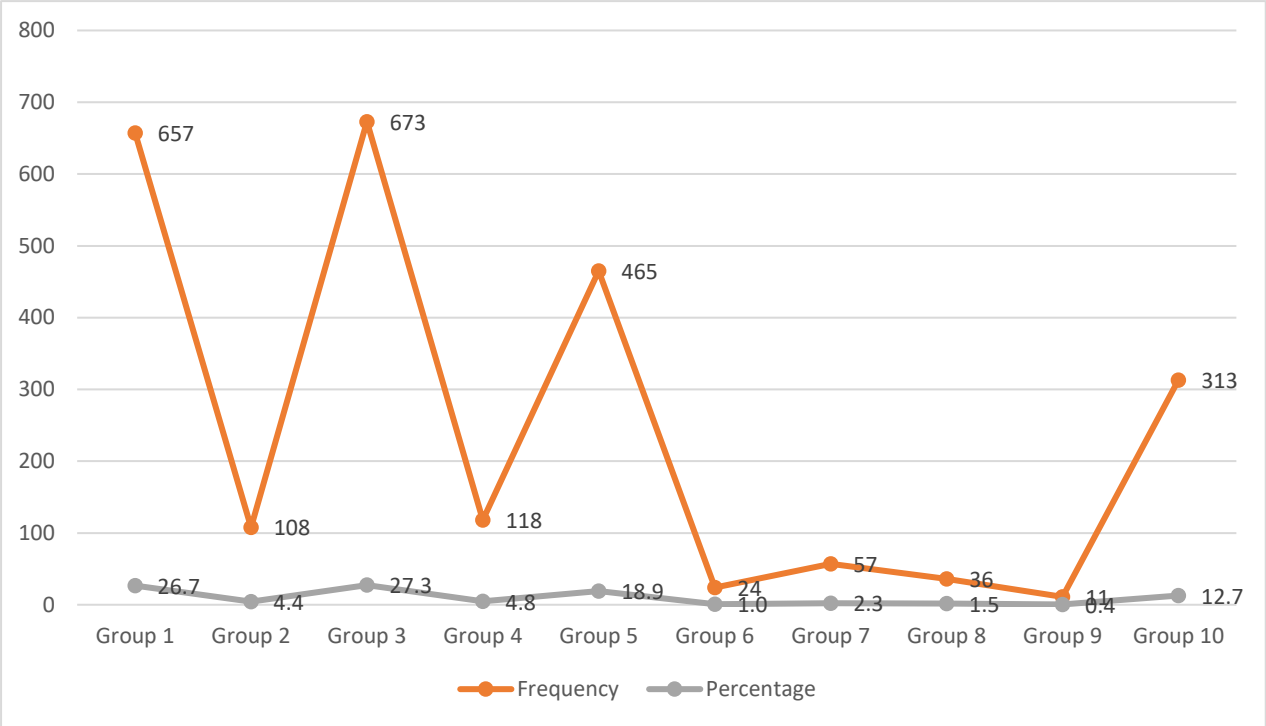

FIGURE 6 FREQUENCY AND PERCENTAGE DISTRIBUTION OF BIRTH EVENTS ACCORDING TO RTGCS IN BOTH HOSPITALS.

TABLE 4 RTGCS WISE CONTRIBUTION ON OVERALL CS FOR BOTH HOSPITALS

Name of the Institute	CMC unit 1 and CoxMC				**Month & Year: Oct-Dec 2022**	
Total number of delivery in the Hospitals:	**NVD**	1201	**CS**	1262	**Total**	**2463**
Group	**Number of CS Group**	**Number of women in group**	**Group Size (1) %**	**Group CS rate (2) %**	**Absolute Group contribution to overall CS rate (3) (%)**	**Relative contribution of the group to overall CS rate (4) (%)**
1. Nullipara single, cephalic, ≥37 weeks, spontaneous labour	242	657	**26.7**	**36.8**	**9.8**	**19.2**
2. Nullipara, single cephalic, ≥37 weeks, induced or CS before labour	106	108	**4.4**	**98.1**	**4.3**	**8.4**
3. Multipara (exclude previous caesarean sections), single cephalic, ≥37 weeks, spontaneous labour	195	673	**27.3**	**29**	**7.9**	**15.5**
4. Multipara (exclude previous caesarean sections), single cephalic, ≥37 weeks, induced or CS before labour	111	118	**4.8**	**94.1**	**4.5**	**8.8**
5. Previous caesarean section, single, cephalic, ≥37 weeks	448	465	**18.9**	**96.3**	**18.2**	**35.5**
6. All nulliparous breeches	19	24	**1**	**79.2**	**0.8**	**1.5**
7. All multiparous breeches (including previous caesarean sections)	46	57	**2.3**	**80.7**	**1.9**	**3.6**
8. All multiparous pregnancies (including previous caesarean sections)	21	36	**1.5**	**58.3**	**0.9**	**1.7**
9. All abnormal lies (including previous caesarean sections)	10	11	**0.4**	**90.9**	**0.4**	**0.8**
10. All single cephalic, < 37 weeks (including previous caesarean sections)	63	313	**12.7**	**20.1**	**2.6**	**5**
Total	**1261**	**2462**	**100**		**51.2**	

(1) Group size (%) = n of women in the group/total N women delivered in the hospital x 100

(2) Group CS rate (%) = n of CS in the group/total N of women in the group x 100

(3) Absolute contribution (%) = no of CS in the group/total N of women delivered in the hospital x 100

(4) Relative contribution (%) = n of CS in the group/total N of CS in the hospital x 100

After analyzing absolute group contribution of overall CS,we can see Group 5(18.2%), Group 1(9.8%),Group 3(7. 9%),Group 4 (4.5%),group 2 (4.3%) are the 5 leading groups which are contributing respectively.

4.3: Clinical Indication of CS:

According to the records, indication for CS has been recorded for 880 cases. Previous Histrory of CS (320), Fetal distress (133), Rupture membrane (74), Pre eclampsia (67),etc are the leading causes of CS in the hospitals. In Figure 7 ,the pie chart illustrates the percentage of causes of CS in the study locations from October to December 2022.

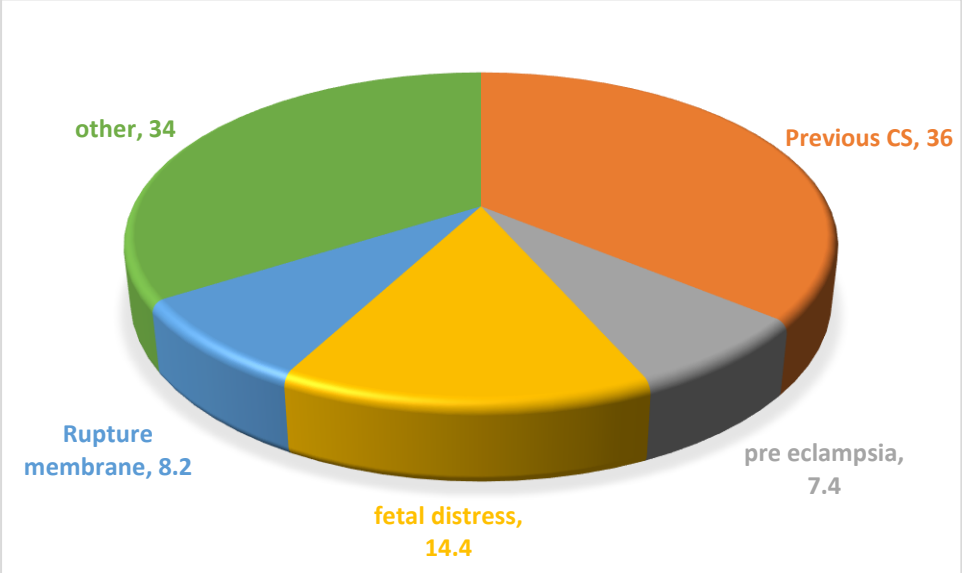

FIGURE 7 INDICATION OF CS IN BOTH HOSPITALS FROM OCTOBER 2022 TO DECEMBER 2022.

4.4: Delivery trend of the Hospitals before and after Using RTGCS

Robson Ten group Classification system has been introduced in September 2022 in the hospitals. We analyzed hospital deliveries one quarter (3 months) before implementing RTGCS (July 2022 to September 2022) and one quarter after Using RTGCS(October 2022 to December 2022).

From July 2022 to September 2022 ,total 5520 deliveries(CMC - 3950,CoxMC -1570) had been conducted in the hospitals; 2483 NVD (CMC -1776,CoxMC-707) and 3037 CS (CMC-2174, CoxMC 863).

In 2nd quarter (October 2022 to December 2022), 3226 NVD (CMC - 2298,CoxMC-928) and 3383 CS (CMC-2436, CoxMC-947)- total 6609 deliverise (CMC -4734,CoxMC-1875) had been conducted in the hospitals. Table 5 demonstrates the monthly delivery trends of both hospitals from July 2022 to December 2022. This data has been collected from monthly hospital EmONC reports.

TABLE 5 NUMBER OF DELIVERY BEFORE AND AFTER USING RTGCS

Period	Month	NVD		CS		Total Delivery
		#	%	#	%	
Before introducing RTGCS	22-Jul	610	40.2	908	59.8	1518
	22-Aug	880	46.0	1033	54.0	1913
	22-Sep	993	47.5	1096	52.5	2089
1st 3 months of introducing RTGCS	22-Oct	1051	47.7	1154	52.3	2205
	22-Nov	1062	50.5	1040	49.5	2102
	22-Dec	1113	48.3	1189	51.7	2302

Figure 8 shows the graphical representation of delivery trends in the hospitals 3 months before (Jul 2022 to September 2022) and 3 months after (October 2022 to December 2022) using RTGCS.

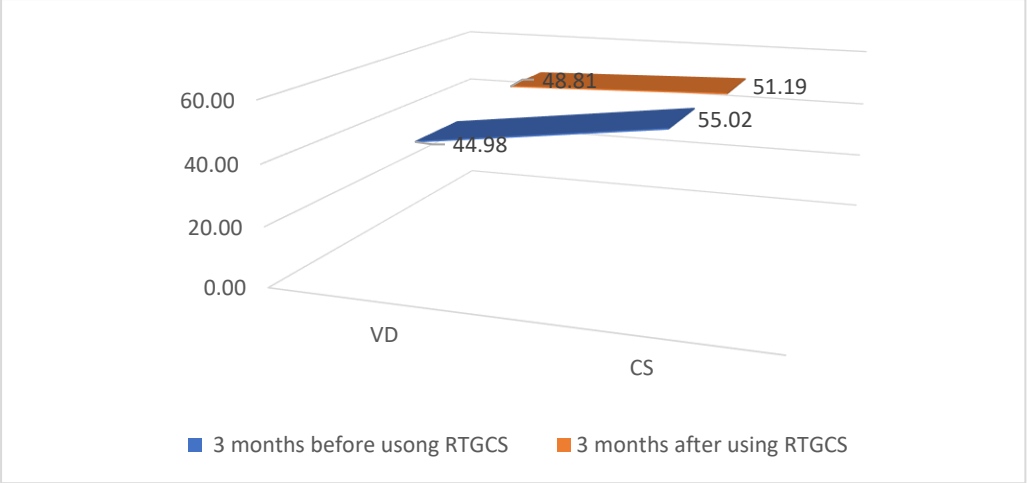

FIGURE 8 QUARTERLY DELIVERY TRENDS(IN PERCENTAGES) BEFORE AND AFTER USING RTGCS IN BOTH HOSPITALS.

In this graphical presentation we can see around cumulatively 4% CS rate has been reduced and 4% VD rate has been raised in 2nd quarter (after using RTGCS) in comparison to 1st quarter (before using RTGCS) in the hospitals.

Qualitative Results:

Three KII and Six IDI and has been conducted in CoxMC. 3 Medical officers and 3 SSN participated in the IDI who are designated for compilation, reporting and monitoring the monthly activities. We summarize the findings according to thematic guideline.

General Perspective regarding CS:

In CoxMC, average 550-600 delivery regularly are conducting among them 300-350 are by cesarean section and 200-250 are by VD. Initially the respondents said the CS rate is normal but after probing they agreed the Cesarean section trend is high here. A medical officer,IDI-1 clarified it as-

"In this hospital 50% CS is seen apparently. As it is a tertiary and referral hospital, we can see most of the cases are referred in from other primary centers when they failed to conduct NVD or there are some complications. So practically the CS rate is higher here but most of them are not unnecessary. And here we always conduct CS if there is any indication. "

All the participants agreed with the statement and according to them, without any absolute and relative indication no CS is performed in the hospital . The common indications here are previous CS, Eclampsia,Pre eclampsia, severe oligohydromnios ,BOH, obstructed labor, some transvere lie cases ,home trial etc.

" Patient or doctor preference for CS are very rare here. We try for VD in every possible cases.I think the cs cases are justified in the hospital"- mentioned by a SSN,IDI -2.

About RTGCS:

For rationalizing the trend an initiative has been taken which is robsons ten group classification system. A day long training has been conducted on the RTGCS. Here doctors,nurses and midwifes were the participants. When a patient admitted, Medical officer history,exclude previous cs,then monitor if she is in labor, if she is primigravida or multigravida, what is the fetal presentation,fetal number.what Is the gestational age,term or preterm etc are considered and then grouping is done accordingly. According to KII 1 –

" We include cases above 28+ weeks in the grouping system.when patient come we entry them in a register, mark a seal there,a 52

column new register was supposed to provided but we did not received it yet."

IDI-4 an Medical officer demonestrates the steps-

> "During admission ,we take history and classify the case in one of the ten groups. We do the grouping on admission.MO usually do the grouping. If the patient is selected for CS ,there the initial grouping is revised if required."

For RTGCS group contributions several opinion has come. 2 IDI answered group 5 is the highest contributing group but rest thinks group 1 and 3 has larger contribution than group 5.According to IDI-5,

> "In this hospital group 3 and 5 are most common. Contribution of group1 is also remarkable. "

Dr. Khairunnesa munni was the focal person.After her retirement,Dr Zakia madam is supervising the system. On monthly admission review the RTGCS findings are discussed .Some changes are happening after the review. According to a medical officer, IDI 6-

> "We usually prefer CS if there is an oligohydramnios case.But Severe oligohydramnios is not an absolute indication for CS. So madam instructed us - if the cervix is favorable then we can wait and try induction for VD. For prolong labor referred in cases, we can assess ,wait and augment with monitoring .For previous CS if the case is fully dilated we are now encouraging AVD.ventose are now encouraging more. Recently 3 ready CS cases has been delivered by AVD".

Challenges :

"RTGCS is undoubtedly an effective tool but implementation of RTGCS in a tertiary referral hospital of Bangladesh is nothing but a paper bases activity if we don't address the existing HR gap" - Quoted by a KII.
According to the participants the following challenges they face following challenges during implementation the Robsons ten group classification systems.

1. Inadequate training participants and duration: Only few service providers got the training and only a day long training is not adequate regarding Robson Ten Group Classification System implementation. So there are lot of confusion on grouping among the Service Providers.
2. Monitoring and supervision : Lack of monitoring and supervision resulting wrong classification and missing information.
3. Lack of HR support: "Gynae and Obs department is one of the busiest and emergency managing ward of any kind of hospital. But there is always HR gaps. With Inadequate manpower it's not possible to provide quality services." -states by a medical officer.
4. Lack of BCC materials: According to IDI 2-

"There is no flowchart or RTGCS guideline available at nursing station, receiving room or doctors station. It's tough to memorize all groups, it create some human error".

IDI 4 says -"EmONC Register book with 52 columns including RTGCS grouping yet not approved at national level."

Mitigation Plan:

According the responses following mitigation plans has come out to mitigate the challenges.

1. Refreshers training: Arranging refreshers training on quarterly basis will help to address all service providers including intern doctors and nurses. A local resource persons pool will help to implement the training on periodical basis.
2. Increasing monitoring and supervision by assigning focal persons among service providers.
3. Encouraging and proper training of service providers regarding TOLAC,VBAC and AVD will help to reduce the number of CS.
4. Mitigate the HR gap: Justified HR allocation by hospital administration according to need will help to mitigate the HR gap.
5. large flowchart of RTGCS grouping can be hang in all service stations.

Chapter 5 (Discussion)

Discussion:

From the hospital monthly EmoNC reports in current study we analyzed 12,129 in-hospital deliveries trend in Chittagong Medical College and 250 bedded District Sadar hospital Cox'sbazar. Between 1st July 2022 and 31st December 2022, the CS rate was 52.9% (Table 5),which is considerably higher than the national average (45%) (23) as well as WHO recommended rate (18).

Mode of delivery were compared in the study in 1 quarter before and 1 quarter after using Robson's Ten Group Classification systems in the hospitals and about 4% changes (CS reduced and VD raised) has been noticed in the delivery trends (figure 8). As the study settings are tertiary and referral hospitals, mostly complicated and referred cases are handled in these hospitals ,it explains the high CS rate and less significant change after implementation of RTGCS.

In this study ,from 1st October 2022 to 31st December 2022 total 2,578 hospital deliveries has been analyzed according to qualitative variables (Age of the mother, parity,gestational week,number of fetus, fetal presentation,onset of labor, previous history of CS,mode of delivery and indication for Caesarean section) and RTGCS groupings. Group specific CS rate Varies from 20.1 % (group 10) to 98.1%(group 2) (figure 4).

Group 1 and Group 3 represented the two largest groups presenting for labor and delivery in this study(table 3). This finding is consistent with a study done in Addis Ababa where Group 1 and Group 3 contributed to 26.7% and 22.2% of all deliveries respectively(13). Similarly, studies done in Bangladesh,Ethiopia, Iran,Jummu and Kashmir showed Group 3 and Group 1 were the two most represented obstetric groups(11,16,17,20) .

Group 5 was found to be the third-largest obstetric group(Table 3). The contribution of this group to the overall CS rate depends on its size (18). As such, Group 5 made the highest contribution to the CS rate accounting for nearly one in three CS deliveries. This is similar for other study findings in Turkey, Iran(3,17). Though the safety and long-term benefits vaginal birth after cesarean (VBAC) are well established,but 96.7% of women in Group 5 underwent repeat CS. Thus, there is a need to evaluate the proportion of women who were offered a trial of labor (TOLAC) and the success rate of VBAC. This will enable the design and implementation of antenatal counseling strategies and labor management protocols, reducing the number of repeat CS.

Group 10 is 4th Contributing group in the study(Table 3). In a study from a tertiary unit in Italy also showed Group 10 was the second largest contributor to the CS rate(13) and in a study in Sanglah General Hospital, Denpasar Group 10 is 3rd largest Contributor (10) This can be explained by the obstetric population served by the facilities. Our study was done in tertiary referral hospitals with a dedicated maternal-fetal medicine unit. A significant proportion of care is given to mothers with major obstetric and medical comorbidities who may require interventions, increasing the likelihood of iatrogenic prematurity. This can account for the higher proportion of Group 10 and its contribution to the CS rate in our settings. In fact, our finding is consistent with studies conducted in tertiary level hospitals.

Group 2 and Group 4 were also important contributors to the overall CS rate(table 3). The CS rate within each group was also about 98.1 % and 94.1% respectively. Existing evidence suggests a high pre-labor CS rate at a particular institution if the CS rate within Group 2 and Group 4 is more than 35% and 20%, respectively (18). Subdividing these groups into induced labor and CS before labor could provide useful information regarding the proportion of pre-labor CS and the success of induction but due to lack of information in the hospital records regarding labor induction we could not justify the findings in the study . This is particularly important as women in these groups are considered low risk. This calls for further investigation of the indications for pre-labor CS. This is completely opposite in a study in Turkey(3). For instance, the CS rate within Group 2 and Group 4 was 10.4% and 7.43% respectively in that 4 years population based study.

Breech comprising “Groups six and seven” are generally expected to be below 4%(18), while in our study it was found as expected but the group CS rate is around 80% (table 3). A more liberal national and institutional protocols that allow assisted vaginal breech delivery in selected women can reduce the group CS rate. Vigorous antenatal monitoring and further analysis should be done to assess maternal and perinatal outcomes among these groups.

In CoxMC, in qualitative data analysis we can see,almost 50% cases are undergone CS and in all tertiary referral hospital this is a common seneario. RTGCS helps us to group the CS cases and identify the group wise contribution. But as indications are not concerned in RTGCS grouping, we can't justify the increased CS trend in this kind of hospitals by using RTGCS.If we can implement RTGCS in all level BEmONC and CEmONC facilities both public and private hospitals(like Union Health and family welfare centres,RD,UHC,MCHC,DH,private hospitals and clinics) then we could find the complete scenario of delivery trend in Bangladesh.For implementing RTGCS in a tertiary level hospital main challenges are inadequate training,lack of monitoring,supervision and followup.This challenges are reversible and could bring a positive change in reducing the number of CS.

The strengths of this study include the large sample size for analysis. The results of this study can serve as baseline data to monitor trends of CS rate over time in the institutions, as well as to compare the practice with that in other institutions.
This study also has some limitations. We planned for FGDs but could not able to conduct for schedule hassle of the service providers in an emergency ward like Gynae and obs due to manpower shortage. Due to lack of availability of data from a single and unique data source may impact the findings. Information regarding onset of labor, labor induction and specific indication for CS was missing for many cases and it's has huge impact on the overall RTGCS findings. This Findings from RTGCS are only a starting point and should be viewed as a means, not an end. We now have a clear insight about "who" is having CS but not "why" the CS is being performed. Crucial variables such as indications, maternal and perinatal outcomes, are not incorporated in the RTGCS, limiting the extent to which conclusions can be drawn from our study. Further Studies needed to evaluate the RTGCS findings over a longer time period and also incorporate the changes after interventions or initiatives taken by the hospital authorities to reduce the group specific CS rates

Chapter 6 (Conclusion and Recommendation)

Conclusion and recommendation:

The Cesarean section rate is alarmingly high in Bangladesh. We analyzed the hospital deliveries by RTGCS to identify specific groups that contributed the most to the overall CS in our setting. Group 5 being the leading contributor indicates a need to focus on that particular group to address the factors leading to a higher rate of CS.

Moreover, the study revealing a high rate of CS among low-risk groups (Group 1 and Group 3) suggests the need for a more in-depth analysis to identify modifiable factors that can reduce CS in these groups. Interventions like reducing primary CS by inducing labor in indicated cases, using partograph for monitoring labor, and promoting Trial of Labor After Cesarean (TOLAC) and Vaginal Birth After Cesarean (VBAC) to reduce repeat CS could be valuable approaches to decrease CS-related morbidity and mortality.

It is concerning to learn that the challenges in implementing Robson Ten Group Classification System (RTGCS) in hospitals include lack of monitoring, inadequate training, and a knowledge gap among service providers. Addressing these challenges is crucial for improving the overall situation and effectively implementing interventions aimed at reducing CS rates.

To further address the issue, evaluating existing management protocols and conducting additional studies into the indications of CS and outcomes in the local setting can help tailor strategies to improve outcomes and decrease unnecessary CS rates. Additionally, introducing RTGCS in all Basic Emergency Obstetric and Newborn Care (BEmONC) and Comprehensive Emergency Obstetric and Newborn Care (CEmONC) facilities, both public and private, will provide policymakers with valuable data to assess the actual scenario of CS rates in Bangladesh and make informed decisions.

In conclusion, addressing the high CS rate in Bangladesh requires a multifaceted approach involving data-driven interventions, training, and policy changes. By focusing on specific target groups, identifying modifiable factors, and improving knowledge and monitoring, it is possible to reduce the CS rate and improve maternal and neonatal outcomes in the country.

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