Analyzing the percentage of cesarean sections in one hospital using Robson ten group classification

Fatima Aladwan MD*,Anas Almasaleha MD*,Safa Almomani MD*,Mutasem Alfshikat MD*,Mohammad Alsabayleh MD*

ABSTRACT

Objective: This study aims to explore the applicability and effectiveness of the Robson Ten Group Classification System (TGCS) as a monitoring and optimization tool for cesarean sections (CS) at Prince Hashim Military Hospital, Jordan.

Methods: A retrospective analysis of CS data from 2020 to 2022 was performed. Relevant variables collected included age, parity, gravidity, gestational age, fetal representation, labor onset, previous scars, and Robson's classification. Statistical analysis was undertaken using the R software package version 4.3.1.

Results: The analysis included 286 samples with a mean age of 28 years. Most samples were multipara (80%) and multigravida (99%). The largest proportion of CS fell into group 10 of TGCS (42%). Significant associations were noted between the TGCS and variables such as the mother's age, fetal presentation, gestational age, and multiple fetuses.

Conclusion: This study illustrates the utility of the TGCS in identifying the maternal and fetal variables contributing to CS rates. The application of TGCS could aid in optimizing CS practices, thereby enhancing maternal and neonatal outcomes.

Keywords: Cesarean section, Robson's Ten Group Classification System, maternal outcomes, neonatal outcomes, cesarean section rates.

Introduction

Over the last few decades, cesarean section (CS) rates have significantly increased globally. In situations where spontaneous vaginal delivery (SVD) is not feasible or advised, opting to avoid CS could potentially jeopardize the health and safety of both the mother and the fetus. Although CS are considered life-saving procedures, they are not devoid of risks, both in the immediate and long-term aspects of subsequent pregnancies. The surge in cesarean section (CS) rates witnessed in numerous developed and middle-income countries stands in stark contrast to the remarkably low rates seen in many low-resource settings, where access to emergency obstetric care is limited. Recent data reveals that in Middle Africa, only 1.8% of all live-birth deliveries are through CS, in comparison to 24.3% in North America and 31% in Central America. [1], [2]

The key challenge is to maintain a low CS rate while ensuring the safety of both the mother and the newborn. To achieve this, continuous monitoring, and auditing of CS procedures in healthcare settings are crucial. There are three commonly used classifications for auditing CSs: based on primary clinical indications, the degree of urgency or necessity for cesarean delivery, and the Robson classification, also known as the Ten Group Classification System (TGCS). [3], [4] M. Robson introduced this classification system in 2001. It divides cesarean sections into ten groups, known as RTGCS, based on various factors, including gestational age, previous obstetric history, presentation, lie, induction, or spontaneous labor, and whether it involves a singleton or multiple pregnancies. [5], [6]

To address the escalating CS rates and ensure the safety of both mothers and newborns, it becomes crucial to strike a delicate balance between the necessity for cesarean sections and the potential risks associated with this procedure. Achieving this balance requires a comprehensive understanding of the factors contributing to the rising cesarean rates and the identification of appropriate measures to optimize cesarean section practices. [7]

This study aimed to explore the applicability and effectiveness of the Robson Ten Group Classification System as a monitoring and optimization tool for cesarean section rates at Prince Hashim Military Hospital. By conducting a retrospective analysis of cesarean section data from 2020 to 2022, this research aimed to shed light on the variations in cesarean section rates across the Robson Ten Groups, thereby identifying areas where tailored strategies could be employed to reduce unnecessary cesarean sections and enhance maternal and neonatal outcomes.

Methods

Study Design and Data Collection
We carried out a retrospective, observational, single-center cohort study at Prince Hashim Military Hospital in the period 2020-2022. The ethical committee waived patients consent due to the retrospective nature of the study and the data did not include any interventions. All pregnant females who underwent cesarean section were included in the study. A total of 300 female samples were enrolled. However, we excluded patients with missing data.

The following variables were collected for all samples: age, parity (multipara or nullipara), gravidity (multigravida or primigravida), gestational age (in weeks), fetal presentation (breech, cephalic, or transverse), onset of labor (spontaneous, elective, or induction of labor (IOL)), number of fetuses, previous scars, APGAR score for Appearance, Pulse, Grimace, Activity, and Respiration, in which fetuses were classified as needs intervention if APGAR score was less than 6 or normal if APGAR score was higher than 6, fetus weight (grams), and the Robson Ten Group Classification.

Statistical Analysis
Categorical variables were presented as frequencies (percentages %), while continuous variables were expressed as mean ± standard deviation (SD) for normally distributed data or median (range) for data with non-normal distribution, as determined by the Shapiro-Wilk test. To examine the correlation between the Robson Ten Group Classification system and maternal and fetal variables, the Wilcoxon (Mann-Whitney U) test was applied for continuous variables, while categorical variables were analyzed using the Chi-squared ($\chi2$) test, and in cases where the cell count was less than 5, the Fisher exact test was employed. Statistical significance was considered at a p-value of less than 0.05. The data analysis was carried out using the R software package version 4.3.1.

Results

Sample Characteristics

A total of 286 pregnant women were included, the remaining 14 patients were excluded because of missing data. The mean age was 28.1 (SD: 6.2), majority of samples 80% were multipara (n=229), while 57 (19.9%) samples were nullipara. Only three samples (1.1%) were primigravida, while 283 (99%) of the sample were multigravida. Most samples had previous scars (n=174, 60.8%). Onset of labor

Mean gestational age was 38.3 (SD: 1.83) weeks, pre-mature labor (gestational age <39 weeks) was observed in 133 (46.5%) of pregnancies, while 153 (53.5%) had term labor. Mean fetus weight was 3,140 (631)? grams and fetal presentation was breech in 21 (7.3%) cases, cephalic in 264 (92.3%) cases, and one case (0.35%) of transverse presentation. Two cases (0.70%) only needed intervention for low APGAR scores. One woman (0.35%) had three fetuses, 4 (1.40%) had two fetuses, while the majority 281 (98.3%) of women had single fetuses.

Robson's Ten Group Classification System

Most of the cases 42% fell in Group 10 of Robson's Ten Group Classification System (n=120), 18 (6.3%) patients were from Group 1, 16 (5.6%) were from Group 2, 20 (7%) were from Group 3, 11 (3.9%) were from Group 4, 77 (26.9%) were from Group 5, 5 (1.8%) were from Group 6, 5 (1.8%) were from Group 7, 5 (1.8%) were from Group 8, and 9 (3.2%) were from Group 9.

There was a significant association between Robson's Ten Group Classification and the mother's age, in which higher age was seen in groups 3, 4, 7, and 9 as shown in **Figure 1A and Table II**. Number of fetuses was significantly associated with Robson's Classification as shown in **Figure 1B**. Fetal presentation was also significantly correlated with Robson's Ten Group Classification, in which all group 6 and 7 cases had breech presentations, 88.9% (n=8) of group 9 had breech presentation and 11.1% (n=1) of group 9 had transverse presentation. The rest of the groups had cephalic presentations as shown in **Figure 1C**. Gestational age was significantly lower in groups 8, 10, 6, and 9 as shown in **Figure 1D.**
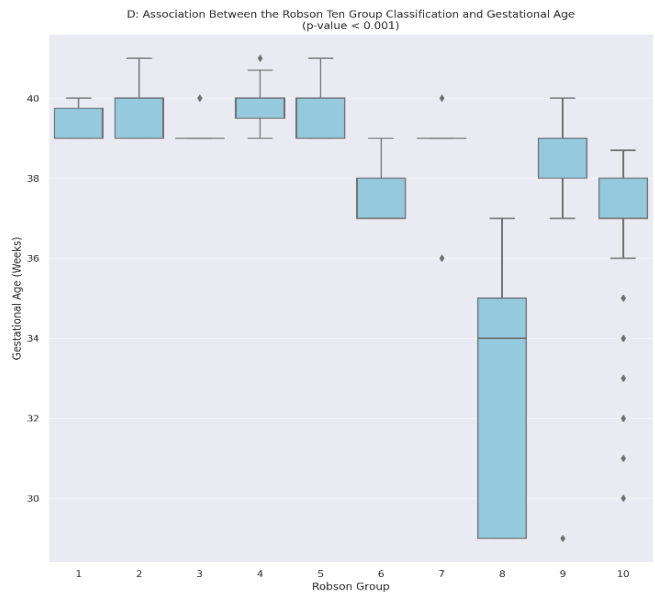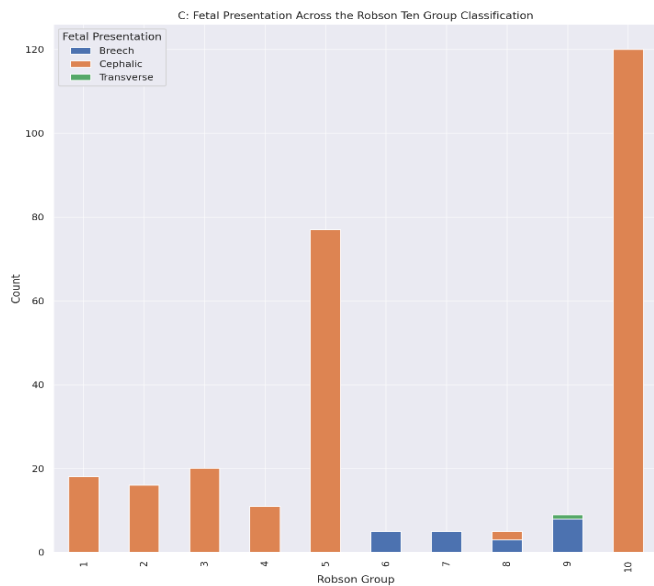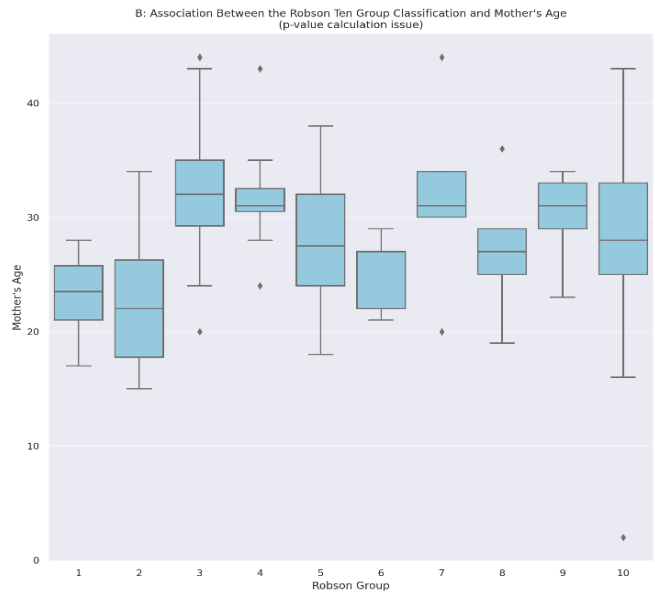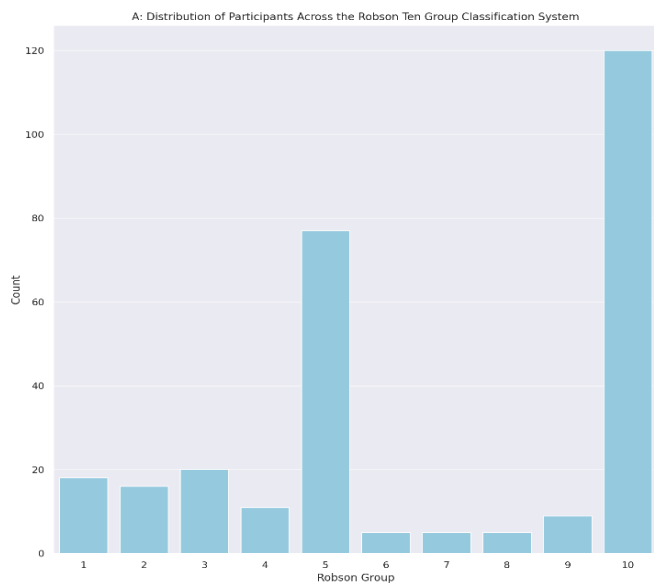
Figure A: Shows the distribution of samples across the Robson Ten Group Classification System.

Figure B: Displays the association between the Robson Ten Group Classification and mother's age. However, there was an issue with the p-value calculation.

Figure C: Represents the fetal presentation across the Robson Ten Group Classification using a stacked bar chart.

Figure D: Depicts the association between the Robson Ten Group Classification and gestational age, with a p-value indicating a statistically significant difference.

Characteristic	N = 286[1]
Age (Years), Mean (SD)	28 (6)
Parity, N (%)	
Multipara	229 (80%)
Nullipara	57 (20%)
Gravidity, N (%)	
Multigravida	283 (99%)
Primigravida	3 (1.0%)
Gestational Age (Weeks), Mean (SD)	38.30 (1.83)
Fetal Presentation, N (%)	
Breech	21 (7.3%)
Cephalic	264 (92%)
Transverse	1 (0.3%)
Onset of Labor, N (%)	
Elective	134 (46.9%)
Spontaneous	116 (40.6 %)
Induction	36 (12.6%)
Number of Fetuses, N (%)	
Single	281 (98%)
Three	1 (0.3%)
Two	4 (1.4%)
Previous Scar (Yes), N (%)	174 (61%)
APGAR, N (%)	
Needs intervention	2 (0.7%)
Normal	281 (99%)
Fetus Weight (g), Mean (SD)	3,140 (631)
Group, N (%)	
1	18 (6.3%)
2	16 (5.6
3	20 (7.0%)
4	11 (3.8%)
5	77 (27%)
6	5 (1.7%)
7	5 (1.7%)
8	5 (1.7%)
9	9 (3.1%)
10	120 (42%)

[1] Mean (SD); n (%)

Table I

Characteristic	1, N = 18[1]	10, N = 120[1]	2, N = 16[1]	3, N = 20[1]	4, N = 11[1]	5, N = 77[1]	6, N = 5[1]	7, N = 5[1]	8, N = 5[1]	9, N = 9[1]	p-value[2]
Age	24 (21,26)	28 (25, 33)	22 (18, 26)	32 (29, 35)	31 (31, 33)	28 (24, 32)	22 (22, 27)	31 (30, 34)	27 (25, 29)	31 (29, 33)	**<0.001**
Gestational Age (Weeks)	39.00 (39.00, 39.75)	38.00 (37.00, 38.00)	40.00 (39.00, 40.00)	39.00 (39.00, 39.00)	40.00 (39.50, 40.00)	39.00 (39.00, 40.00)	38.00 (37.00, 38.00)	39.00 (39.00, 39.00)	34.00 (29.00, 35.00)	39.00 (38.00, 39.00)	**<0.001**
Fetal Presentation											**<0.001**
Breech	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0(0%)	0 (0%)	*5 (100%)*	5 (100%)	3 (60%)	8 (89%)	
Cephalic	18 (100%)	120 (100%)	16 (100%)	20 (100%)	11 (100%)	77 (100%)	0 (0%)	0 (0%)	2 (40%)	0 (0%)	
Transverse	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (11%)	
Number of Fetuses											**<0.001**
single	18 (100%)	120 (100%)	16 (100%)	20 (100%)	11 (100%)	77 (100%)	5 (100%)	5 (100%)	0 (0%)	9 (100%)	
Three	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (20%)	0 (0%)	
Two	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (80%)	0 (0%)	

Table II

Discussion

The present retrospective study aimed to investigate the potential utility of the Robson Ten Group Classification System as a tool for monitoring and optimizing cesarean section (CS) rates at Prince Hashim Military Hospital as recommended by The World Health Organization by allowing the monitoring of healthcare institution and be served as a guide to our practices [8]. The study population comprised 286 pregnant female samples who underwent cesarean sections during the period from 2020 to 2022.

The findings of this study revealed that the majority of samples were multipara (80%), while only a small proportion were nullipara (20%). Similarly, a study by Asali et al. on the Jordanian population found that 70% of women indicated for c-section were multipara, of which 86% had previous c-sections. [9] Additionally, most of the samples were multipara (99%), and approximately two-thirds had previous cesarean section scars (61%). These characteristics are important to consider as they may impact the decision-making process regarding the mode of delivery [10]. Multiparous women, particularly those with a history of previous cesarean sections, might face different considerations during the decision-making process. The likelihood of encountering complications or the potential need for repeated cesarean sections may be higher in multiparous individuals. Factors like the presence of uterine scarring from previous cesarean sections can influence the feasibility and safety of a vaginal delivery. In addition, women with previous cesarean section scars are often considered in the context of vaginal birth after cesarean (VBAC) or elective repeat cesarean section. Therefore, the presence of cesarean section scars plays a crucial role in determining the safest mode of delivery for both the mother and the baby [11], [12]. Previous study by Dulitzki et al. reported that advancing age and higher parity are linked to an elevated risk of adverse pregnancy outcomes [13], [14].

Interesting patterns emerged when we analyzed the associations between the Robson Ten Group Classification and maternal and fetal variables. Higher maternal age was associated with Groups 3, 4, 7, and 9, suggesting that advanced maternal age might be a contributing factor to cesarean section decisions in these groups. [15] Studies have shown that advanced maternal age at childbirth is associated with higher pre-pregnancy morbidity and related risk factors, which may contribute to an elevated likelihood of cesarean section. In a study that investigated the relationship between parity and the mode of delivery in women of advanced maternal age, the findings revealed that women in this age group were more inclined to undergo cesarean sections. [16] Several studies have proposed that certain physicians might perceive older multiparous women to have a higher risk of adverse pregnancy outcomes during vaginal delivery. These women are also believed to exhibit dysfunctional labor patterns, potentially leading physicians to favor cesarean sections as a preferred mode of delivery. [17]–[19] A study by Qublan et al. on the Jordanian population indicated that older mothers with high parity face an elevated risk of specific pregnancy and labor complications that necessitate abdominal delivery. [20] Furthermore, c-section rates in pregnant women with malpresentation were highest among women aged >35 years or older.

The fetal presentation withing Groups 6 and 7 exclusively comprised breech presentations, and the majority of Group 9 cases also exhibit breech presentation, while one case had a transverse presentation. These findings imply that fetal presentation is an important determinant in the choice of delivery mode. This is due to the fact that Cesarean sections in breech or transverse presentation involve more complex procedures compared to those in cephalic presentation, requiring additional manipulations to guide the presenting part of the fetus, liberate the arms, and deliver the after-coming head [21].

Furthermore, gestational age was notably lower in Groups 8, 10, 6, and 9, indicating a potential need for cesarean section in cases of preterm labor or post-term pregnancies. This can also be due to the fact that group

10 include all single-cephalic and less than 37 weeks gestation [22]. All cases involving multiple fetuses were allocated to Group 8, highlighting the relevance of this parameter in making decisions about cesarean deliveries.

Our study owns some strengths; to our knowledge, this is the first study in the country that employs the Robson Ten Group Classification in managing CS procedure rates. The sample size was fairly adequate for descriptive analysis. Some limitations include the retrospective nature of the study, which limits the ability to draw causal inferences.

In conclusion, the findings of our study suggest that this system could be an important tool for auditing and monitoring CS rates, thereby helping to optimize cesarean practices and improve maternal and neonatal outcomes. However, future large-scale, multi-center studies are needed to confirm and expand these findings.

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