ORIGINAL ARTICLE

Examining the Efficacy of the Robson Classification System for Optimizing Cesarean Section Rates in South Asia

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Abstract

Aim: To apply the Robson Ten Group Classification System (TGCS) in major South Asian hospitals to begin making recommendations to optimize cesarean section (CS) rates.

Materials and methods: This cross-sectional study was conducted from September 2018 to February 2019 at public sector hospitals in five South Asian countries. We analyzed the pooled data for all five hospitals. The data were then stratified by the study hospitals. We utilized a Pearson χ^2 test to assess differences in CS by group. And p values <0.05 were considered statistically significant. Statistical analysis was performed using STATA 16.

Results: A total of 37,251 women delivered in the five participating hospitals during the 6-month study period. Of these, 13,592 women were delivered by CS with a composite CS rate of 36% (range, 22–53%). Women in groups 1, 2, and 5 were the largest contributors to the overall CS rate in the participating hospitals. Statistically significant differences in CS rates between the hospitals were found in all groups except group 9.

Conclusion: TGCS is useful as a starting point with which to identify patient groups warranting interventions to optimize CS. However, data collection alone is not sufficient. Analysis and interpretation should also include assessing maternal and neonatal outcomes.

Clinical significance: Preliminary findings indicate that strategies to optimize the use of CS should include avoidance of medically unnecessary primary CS and increasing vaginal birth after cesarean.

Keywords: Cesarean section rates, Cross-sectional study, Optimizing CS rates in South Asia, Robson Ten Group Classification System.

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Introduction

South Asia has experienced the second largest absolute increase in cesarean section (CS), reaching 19.2% in 2014 up from 7.2% in 2000, with an annual rate of increase of 6.4%.[1] Each country in the region experienced an increase in their respective national rates.[2,3] However, overall rising rates mask disparities in care across socioeconomic groups.[4–7] Meanwhile, there is a growing consensus that the rise may not be medically indicated, and evidence shows that medically unjustified CS has negative consequences for maternal and newborn health.[8–11] In 2017, key stakeholders including the WHO[12] and the International Federation of Obstetrics and Gynecology (FIGO)[13] endorsed the use of the Robson Ten Group Classification System (TGCS) for assessing, monitoring, and comparing CS rates. This system has been widely used and assessed.[14–19] It facilitates analysis according to routinely collected characteristics of pregnancy and classifies all women admitted for delivery into one of 10 groups that are mutually exclusive and totally inclusive.[20,21]

In South Asia hospitals, by tradition, maintain manual data on perinatal events including CS; however, a comparative analysis is hampered by institutional differences in practice and inconsistencies in definitions and data collection. Against this backdrop, the Maternal and Newborn Health Committee of the South Asian Federation of FIGO recommended this study be undertaken. The aim was to apply the Robson TGCS analysis in selected South Asian hospitals to begin making recommendations to optimize CS rates and to demonstrate that TGCS is a usable tool for the region despite challenges in data collection.

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Materials and Methods

This cross-sectional study was conducted for a period of 6 months from September 2018 to February 2019 at five urban, public sector, tertiary care hospitals in five countries of South Asia. The data set includes 37,251 deliveries. All women who gave birth at the hospitals during the study period were eligible for inclusion and classified using the TGCS. The participating hospitals are as follows:

1. Rabia Balkhi Maternity Hospital, Kabul, Afghanistan (n: 11,873),
2. Chittagong Medical College, Chittagong, Bangladesh (n: 8,761),
3. Paropakar Maternity and Women's Hospital, Kathmandu, Nepal (n: 10,245),
4. Services Institute of Medical Sciences, Lahore, Pakistan (n: 5,173), and
5. Asiri Central Hospital, Colombo, Sri Lanka (n: 1,199).

The data were collected in the participating hospitals on standardized forms and submitted monthly to the Women's Health Intervention and Development Initiative (the lead author's nongovernmental organization headquartered in Peshawar, Pakistan) for analysis.

We analyzed the pooled data for all five hospitals (Table 1) in accordance with the WHO manual on TGCS. The data were then further stratified by the five study hospitals. We utilized a Pearson χ^2 test to assess differences in the proportion of CS by group, and p values <0.05 were considered statistically significant (Table 2). Statistical analysis was performed using STATA 16.

Results

A total of 37,251 (range, 1,199–11,873) women delivered in the five participating hospitals during the study period. Of these, 13,592 women delivered by CS (range, 344–3,183) with a collective CS rate of 36% (range, 22–53%). The overall CS rate for each hospital is shown in Figure 1.

Table 1 presents Robson's classification report table for pooled data for all five hospitals.

Table 2 presents the CS rates within each TGCS group in the participating hospitals. Statistically significant differences in CS rates between all TGCS groups within and between hospitals were observed (except group 9).

Detailed analysis of groups 1–5 is presented since these groups account for the majority of cases in our data set. The collective

Table 1: Robson's classification report table[a]

Group	*No. of CS*	*No. of deliveries*	*Relative size of the group*	*CS rate*	*Absolute contribution of group CS to overall CS*	*Relative contribution of group CS to overall CS*
1	2,577	9,188	25%	28%	7%	19%
2	1,886	4,037	11%	47%	5%	14%
3	1,697	12,958	35%	13%	5%	12%
4	1,240	2,709	7%	46%	3%	9%
5	3,553	3,846	10%	92%	10%	26%
6	509	574	2%	89%	1%	4%
7	348	639	2%	54%	1%	3%
8	406	642	2%	63%	1%	3%
9	213	217	1%	98%[b]	1%	2%
10	1,163	2,431	7%	48%	3%	9%
Total	13,592	37,251	100%	36%	36%	100%

[a]Rounded to the nearest whole number; [b]By convention this should be 100%, but an apparent error in data collection occurred at 2 of the participating hospitals

Table 2: CS rates in each group by hospital

Group	*All countries* [a]*n (%)*	*A* [a]*n (%)*	*B* [a]*n (%)*	*C* [a]*n (%)*	*D* [a]*n (%)*	*E* [a]*n (%)*	*p values*[b]
1	2,577/9,188 (28.05)	97/1,128 (8.60)	814/1,912 (42.57)	1,137/4,282 (26.55)	515/1,604 (32.11)	14/262 (5.34)	<0.001
2	1,886/4,037 (46.72)	326/1,187 (27.46)	543/906 (59.93)	810/1,431 (56.52)	107/246 (43.50)	100/267 (37.45)	<0.001
3	1,697/12,958 (13.10)	645/6,912 (9.33)	643/2,050 (31.37)	265/2,539 (10.44)	143/1,219 (11.73)	1/238 (0.42)	<0.001
4	1,240/2,709 (45.77)	567/1,211 (46.82)	419/841 (49.82)	192/397 (48.36)	40/133 (30.08)	22/127 (17.32)	<0.001
5	3,553/3,846 (92.38)	457/524 (87.21)	1,316/1,384 (95.09)	584/592 (98.65)	1,083/1,194 (90.74)	113/152 (74.34)	<0.001
6	509/574 (88.68)	123/124 (99.19)	156/177 (88.14)	161/187 (86.10)	57/64 (89.06)	12/22 (54.55)	<0.001
7	348/639 (54.46)	100/164 (60.98)	113/213 (53.05)	77/95 (81.05)	48/150 (32.00)	10/17 (58.82)	<0.001
8	406/642 (63.24)	200/278 (71.94)	80/180 (44.44)	41/85 (48.24)	66/73 (90.41)	19/26 (73.08)	<0.001
9	213/217 (98.16)	12/12 (100)	85/87 (97.70)	44/44 (100)	66/68 (97.06)	6/6 (100)	NA
10	1,163/2,431 (47·84)	129/323 (39.94)	496/1,011 (49.06)	246/593 (41.48)	245/422 (58.06)	47/82 (57.32)	<0.001

[a]n, number of cesarean sections in the group/total number of births within the group; [b]p value from Pearson χ^2 test comparing cesarean section rates by hospital in each group.

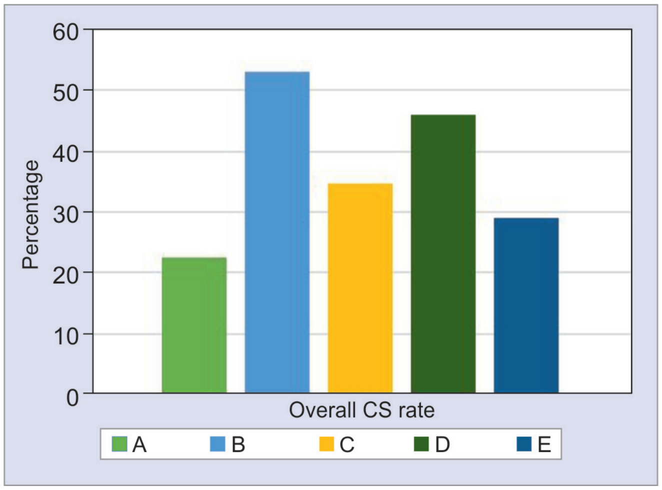

Fig. 1: Overall CS rate by hospital

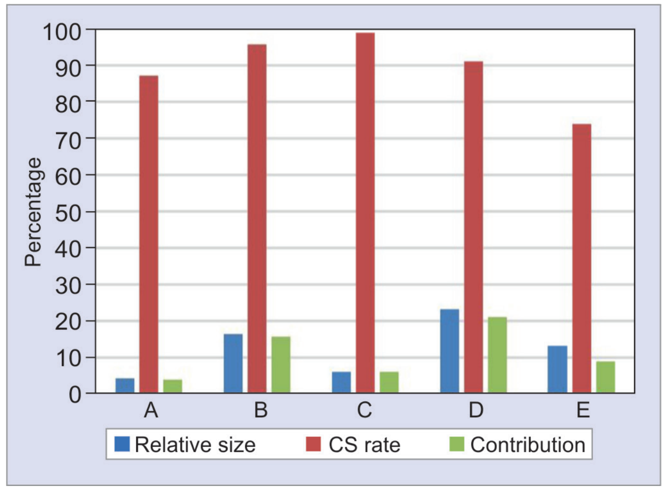

Fig. 3: Group 5 previous CS, single, cephalic, ≥37 weeks

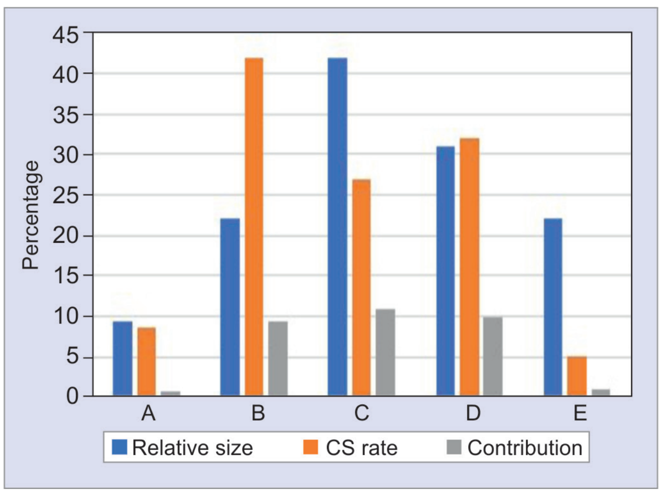

Fig. 2: Group 1 nulliparous, single cephalic, ≥37 weeks, in spontaneous labor

contribution to the CS rate of groups 1–5 was 30% of the 36% total overall CS rate. Groups 6–9 had high CS rates, but due to their small group sizes, did not substantially contribute to the overall CS rate and thus are addressed more briefly.

A quarter of the women in the pooled data were in group 1 (nulliparous, single, cephalic, at or above 37 weeks, in spontaneous labor). However, the relative size of this group varied dramatically between hospitals (9–42%). Overall, group 1 had a relatively high CS rate of 28% with a wide range (5–43%). Hospitals A and E had lower CS rates of 9 and 5%, respectively, resulting in significantly lower contributions to their CS rates (1 and 0·82%) compared to the other three hospitals. This is illustrated in Figure 2:

The largest single group was group 3 (12,958 deliveries; 35% of total deliveries). This was primarily because in hospital A almost half the population was in this group. Overall, the CS rate in group 3 was 13% with an absolute contribution to the composite CS of 5%. Notably, hospital E had only one CS in this group although the relative size of the group (20%) was only marginally smaller than hospitals B, C, and D.

To further understand variations in regional obstetric practice, we studied groups 1 and 3 together (nulliparous and multiparous women in spontaneous labor). The relative size of groups 1 and 3 together was 59% (42–67%). The overall absolute contribution to CS was 12% but when we looked at the CS rates in individual hospitals, the range was 5% (E) to 74% (B). The range of contribution to CS rates was 1% (E) to 17% (B). Hospital B also had the highest overall CS rate.

We also compared groups 2 and 4 (nulliparous or multiparous, induced or prelabor CS) which had high CS rates averaging 47% (range, 27–57%) and 46% (range, 17–48%), respectively. We did not assess subgroups "a" (induction) or "b" (elective CS) so we cannot conclude what led to this high rate (whether it was failed induction or elective CS).

The overall relative size of groups 3 and 4 (multipara whether in spontaneous labor, induced or elective CS) was 42% (range, 23–51%). The 51% size observed in hospital A suggests the general population in A was multiparous in contrast to C where the relative size for groups 3 and 4 was 23%.

In the pooled data from all hospitals, group 5 (previous CS) was just 10% of total deliveries (range, 4–23%), but the CS rate of 92% (range, 74–99%) was the second highest of all groups. Thus, it had the greatest absolute and relative contributions to overall CS. However, there was great variation in the absolute contribution to the CS rate in the individual hospitals with a range of 4–21%. Two hospitals (D and B) with the highest CS rates of 46 and 53% had high contributions to their CS rates in group 5 as well of 21 and 16%, respectively (Fig. 3).

Discussion

Our study showed high rates of CS in the participating hospitals. In four hospitals (excluding Sri Lanka), rates were significantly higher than national estimates.[22] We also found significant variations in overall CS rates between hospitals (range, 22–53%) and among groups, demonstrating that composite averages mask variations at institutional level. We cannot with authority state the reasons for these high rates or comment on whether these rates are optimum for a particular hospital since investigating specific indications was beyond the scope of this study. However, such high rates, especially in groups 1–4, suggest that a proportion was not medically indicated.

Of the study population, 88% were in groups 1–5 (all nullipara and multipara with a singleton baby, at term, cephalic, in spontaneous labor, induced or elective CS, and all previous CS). This is consistent with findings in earlier studies.[13–19] However, there were substantial differences between hospitals in the relative sizes of the groups (especially groups 1 and 3), as also observed by Brennan in his comparative analysis.[23] This could be partly due to data quality, differences in epidemiological variables, case-mix, and practice variation.[24]

Notably, a quarter of the women in the pooled data from all five hospitals were in group 1. The combination of groups 1 and 2 (all nulliparous women whether in spontaneous labour, induced or elective CS) accounted for 36% of the patient population in the five hospitals, but the range was wide (19–58%). A third of the CS (12% of 36%) were in groups 1 and 2 (nulliparous women). In a single-institute study over 35 years, Brennan observed a dramatic increase in CS rates in groups 1 and 2 and that nulliparous CS rates correlated with overall CS.[25] Multiparous women in groups 3 and 4 contributed a further 8% to overall CS rates (Table 1).

These high rates of CS in apparently low-risk women (groups 1 and 3 who are the majority of the patient population) could be explained, in part, by the quality of care issues which exist in the region. Many of these women may have started in spontaneous labor, but developed complications due to mismanagement in smaller, poorly equipped hospitals or by untrained traditional birth attendants before they arrived at tertiary level facilities. Public sector hospitals in South Asia generally receive high-risk (complicated) patients (professional consensus). However, women with particular obstetric risk factors (groups 6–9; such as breech presentation, multiple pregnancy, or transverse lie) did not significantly contribute to the overall CS rate in individual hospitals or on the whole since the relative sizes of these groups are consistently small. The rise in CS, therefore, is driven not by high-risk pregnancies but mainly by complicated low-risk pregnancies.[26]

Given this trend, the size of group 5 will continue to increase. In the South Asian context, vaginal birth after CS (VBAC) is not standard practice due to multiple issues.[27] It is not offered at all or generally offered only after one previous CS. Since we did not look at subgroups 5a (previous one CS) or 5b (previous two or more), we are unable to make specific inferences.

Although group 5 (previous CS) was an important determinant of overall CS rates across these hospitals, presently the group size is relatively small at around 10% (range, 4–23%), indicating that the rise in CS is relatively recent in some of the hospitals. The two hospitals (B and D) with the highest CS rates also had high rates in group 5. This finding is consistent with the results of single-institution studies done in the region and globally.[13–19] Hospitals with small group 5 size such as A (4%) and C (6%) had relatively lower CS contribution, although their CS rates were high at 87 and 99%, respectively. This illustrates that the contribution depends on both the CS rate and the relative size of the group.

In South Asia facility deliveries are increasing. However, this has not proven to be a panacea for maternal and perinatal health.[28] Earlier evidence showed that the rising rate of CS is driven by private sector deliveries of rich urban women,[29] yet our study found a high CS rate in public sector hospitals. This is alarming as these hospitals generally cater to low- and middle-income women often living in marginalized communities with poor access to comprehensive emergency obstetric care.[30] Moreover, although widely available, CS is not always performed in the best environment by qualified obstetricians and anesthetists. In many smaller, peripheral, public sector hospitals, quality care services are not available[31,32] and anesthesia-related deaths are on the increase.[33]

The short- and long-term risks associated with CS not only impact the current pregnancy but also have a detrimental effect on future pregnancies,[34,35] and the risks increase with every subsequent CS delivery.[36] The CS rate in groups 1–5 is rising rapidly. The implication, especially given the high fertility rate in the region and the low prevalence of VBAC, is a cascading effect of rising CS that is likely to be detrimental to overall maternal and perinatal health in the region. Importantly, treatment of the most serious complication of repeat CS *placenta accrete spectrum* requires a multidisciplinary team for assessment/diagnosis and management,[37] which is not available in most public sector hospitals in the region. Yet among patients, there is a growing perception that CS is safer than vaginal birth for the baby.[38] As a result, CS on demand for various reasons including the delivery of a male child, fear of pain, and for a so-called prolonged labor are becoming more routine.

It is crucial to assess the use of CS in conjunction with analysis of maternal and perinatal outcomes, as Robson states "overall CS rates are unhelpful, and CS rates should not be judged in isolation from other outcomes and epidemiological characteristics…."[39] This is illustrated by our data, especially from two hospitals. Hospital A in Afghanistan (MMR 400) and hospital E in Sri Lanka (MMR 30) are on opposite ends of the maternal mortality spectrum[1] yet both had relatively low and comparable overall CS rates (hospital A 22% and E 29%) and had negligible contribution to the CS rate in group 1. This apparent similarity is likely masking differences in obstetric practices, the quality of the health infrastructure, and patient population case mix.

Conclusion

To our knowledge, this is the first study to utilize the TGCS to analyze a sample of CS data across five countries in South Asia. Our study confirms that composite data mask crucial variations in the use of CS and that significant differences in both CS rates and relative group sizes between hospitals exist. Similarities were also found; yet absent deeper analysis, they could be deceptive, as illustrated by the cases of apparent similarities in the Afghanistan and Sri Lanka CS rates. In light of variations in patient populations, the overall quality of health systems, and clinical practices across South Asian countries, it is clear that collecting data on CS alone is not sufficient. Analysis, interpretation, and incremental addition of subgroups with other maternal and neonatal outcomes are required to provide evidence to optimize its use and to improve the quality of care.

We conclude that the TGCS is useful as a starting point with which to identify patient groups warranting interventions to optimize CS use in South Asia. This study provides a preliminary investigation in order to begin making recommendations to optimize CS rates in South Asia and to demonstrate that TGCS is a usable tool for South Asia despite region-wide challenges in data collection. Thus, it serves as a model for institutionalizing the use of the TGCS in other hospitals in the region and national implementation for more robust analysis. Moreover, to enhance the quality of data collection and interpretation, training is necessary.

Clinical Significance

Although we cannot extrapolate our data to the whole of South Asia, it provides a glimpse into the prevailing situation and offers some insights on strategies to optimize CS rates with an emphasis on avoiding medically unnecessary primary CS, improving case selection for induction of labor and prelabor CS, and increasing the use of VBAC.[40]

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