ORIGINAL ARTICLE

ANALYSIS OF CAESAREAN SECTION RATES USING THE ROBSON'S TEN GROUP CLASSIFICATION SYSTEM (TGCS) AT TERTIARY LEVEL HEALTHCARE FACILITIES IN RAWALPINDI, PAKISTAN: A CROSS-SECTIONAL STUDY

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Background: Robson's Ten Group Classification System (TGCS) is recommended as a global standard for assessing, monitoring, and comparing Cesarean Section rates at all levels. This study was conducted to audit CS deliveries using the Robson TGCS to understand the current CS practices and analyze the groups of women who are mainly contributing to the rising rates of CS in Pakistan. **Methods:** A cross-sectional study was conducted in three tertiary care hospitals in Rawalpindi, Pakistan. All women who gave birth in these health facilities between, June to August 2019, were included in the study. Data were collected using a standardized proforma and analyzed using Robson guidelines to calculate each group's relative size, group-specific CS rate, and relative and absolute group contributions toward overall Caesarean section rates. **Results:** A total of 5,657 deliveries were analyzed. Out of these, 2255 (40%) were Cesarean sections. Women in Group 3 made the largest contribution to the obstetric population accounting for 26.3% of all deliveries. The largest contributors to the overall CS rate were Group 5 (41.7 %), Group 10 (17.3%), and Group 2 (12.7%). **Conclusion:** A CS rate of 39.9% was reported, which is much higher than the WHO recommended optimal rate of CS. Group 5 (previous CS) was found to be the largest contributor to the overall CS rates followed by Group 10. This study provides a model for institutionalizing RTGCS and should be replicated in other districts of Pakistan.

Keywords: Cesarean section; TCGS; Robson guidelines; Pakistan; CS rates

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INTRODUCTION

Over the years, the use of Caesarean sections (CS) has increased dramatically worldwide to an extent that we are currently facing a global epidemic of (CS). The numbers increased from 12% in 2000 to approximately 21% in 2015, and are further increasing by 4% annually.[1] Latin America and the Caribbean region has the highest CS rates (40.5%), followed by Northern America (32.3%), Oceania (31.1%), Europe (25%), Asia (19.2%), and Africa (7.3%).[2] In Asia, an increase in Caesarean delivery rates have been observed in several countries, including India, Pakistan, Nepal, China, and Bangladesh.[3] Several reasons explain this evident increase, including the availability and accessibility of resources, type of institution, patient characteristics, labor management protocols, obstetric practice, and most importantly the choice of affluent women who can afford it and therefore pre-plan CS.[4,5] CS rate is an important indicator of emergency obstetric care[6] and CS rates between 10–15% at a population level are associated with a decrease in maternal, neonatal, and infant mortality[7]. CS Rates above this level are not significantly associated with reduced mortality; infact evidence is available that its non-medical indications can cause adverse health outcomes.[4,8]

Despite an overall increase in CS rates, a secondary analysis of demographic and health surveys (DHS) and multiple indicator cluster (MICS) surveys conducted in 72 low and middle-income countries between 2010 and 2014 found a substantial wealth related inequality in caesarean section rates.[2] Pakistan presents a similar picture, and the CS rates have increased from 3.1–22.3% in the last two decades[10,11] with reported rural and urban CS rates of 18% and 32% respectively. Equity analysis showed that women in the highest wealth quintile were more likely to be delivered by CS (46%) compared to women in the lowest quintile (8%). Further, more developed and urban provinces like Punjab have higher CS rates (29%) than the less developed province like

Balochistan (4%). Private health facilities (38%) report higher CS rates as compared to public health facilities (25%).[11]

To determine the optimal or adequate rate of caesarean sections in a country is an extremely challenging task.[12] A systemic review of existing CS classification systems conducted in 2011 recommended that 10–15 percent deliveries conducted by C section in any population is a justifiable rate.[13] Furthermore, Robson Ten Group Classification System (TGCS) was recommended to be the most suitable classification to optimize CS rates, which was endorsed by WHO in 2015.[14] Robson classification system (Table 1) gives a thorough insight into the reasons for high CS rates and offers a standardized comparison among many institutions, countries, and regions over time.[15] While a number of countries have implemented and institutionalized Robson TGCS, Pakistan lacks the experience of implementing TGCS in a standardised manner and its analysis. This study was therefore conducted in three tertiary care health facilities in Rawalpindi, Pakistan to audit CS deliveries using the Robson TGCS to analyze which groups of women are mainly contributing to the rising rates of CS, and understand the current CS practices to develop recommendations to improve the quality of maternal healthcare.

Table-1: Robson Ten Group Classification System

Group 1	Nulliparous, singleton cephalic, ≥ 37 weeks, in spontaneous labour
Group 2	Nulliparous, singleton cephalic, ≥ 37 weeks, induced or CS before labour
2a	Nulliparous, singleton, cephalic, ≥ 37 weeks' gestation, induced labour
2b	Nulliparous, singleton, cephalic, ≥ 37 weeks' gestation, CS before labour
Group 3	Multiparous (excluding previous cesarean section), singleton, cephalic, ≥ 37 weeks' gestation, in spontaneous labour
Group 4	Multiparous without a previous uterine scar, with singleton, cephalic pregnancy, ≥ 37 weeks' gestation, induced or cesarean section before labour
4a	Multiparous without a previous uterine scar, with singleton, cephalic pregnancy, ≥ 37 weeks' gestation, induced labour
4b	Multiparous without a previous uterine scar, with singleton, cephalic pregnancy, ≥ 37 weeks' gestation, cesarean section before labor
Group 5	Previous cesarean section, singleton, cephalic, ≥ 37 weeks' gestation
5.1	With one previous CS
5.2	With two or more previous CSs
Group 6	All nulliparous with a single breech
Group 7	All multiparous with a single breech (including previous cesarean section)
Group 8	All multiple pregnancies (including previous cesarean section).
Group 9	All women with a single pregnancy in transverse or oblique lie (including those with previous cesarean section)
Group 10	All singleton, cephalic, < 37 weeks' gestation pregnancies (including previous cesarean section).

MATERIAL AND METHODS

A facility based cross-sectional study was conducted in three tertiary care public health facilities in Rawalpindi, Pakistan. One of the hospital had two gyne/obs units and both units were included in the study. Each of these hospitals cater for 1,000 to 2,000 deliveries per month, including a large number of referrals from primary and secondary health facilities of neighboring districts. All women who gave birth in these health facilities between June to August 2019 were included in the study.

During the preparatory phase, consultative meetings were held with key stakeholders, including the federal ministry of health (MoNHSR&C), WHO Pakistan, departmental heads of gynae/obs units and senior obstetricians, to promote awareness regarding use of Robson classification system and to optimize the project design. One focal person from each gynae/obs unit was identified to work with the core research team. In addition, two post graduate trainee doctors were selected in each unit to prospectively collect data on all deliveries conducted between June to August 2019, using the standardized log sheet, that was filled from the hospital records. A two days training was conducted by the principal investigator for the research team which included the department heads, focal persons and the data collection team. The training focused on providing awareness of Robson classification system and its implementation in clinical settings. Data collection tools were explained and hands on practice on using the tool was done. Monitoring and quality assurance process was also discussed. The entire approach including the data collection tool was pilot tested and the issues identified in pilot testing were rectified.

Data were prospectively collected from all women using a log sheet that was filled using hospital records, on the six core obstetric variables suggested by Robsons TGCS using a standardized tool. These six variables included: 1) Fetal presentation, classified as cephalic, breech or transverse/oblique. 2) Gestational age, categorized as a term (≥37 weeks) or preterm (<37 weeks). 3) Onset of labour, categorized as spontaneous, induced or caesarean section before labour. 4) Parity, classified as nulliparous or multiparous 5) Number of fetuses categorized as

singleton or multiple pregnancies 6) Previous CS, defined as one or more than one caesarean sections.[14]

Data were entered in MSExcel 2019 and was transferred to SPSS version 26.0 after cleaning. Data were analyzed according to the recommendations of the WHO Robson classification manual and synthesized into standardized reporting tables.[16,17] All women who delivered in the 3 hospitals within the data collection period were classified into 10 groups described by Robson. Group 2, 4 and 5 were further subclassified into 2a, 2b, 4a, 4b and 5.1 and 5.2 respectively. Further analysis included calculation of CS rates by type of population as per WHO Robson analysis guidelines. Results were generated in a standardized way which included; group size, group Caesarean section rate, relative percentage contribution of each group in relation to the total number of caesarean sections and absolute percentage contribution of each group in relation to the overall deliveries. Finally, results were compared with standardized Robson's classification guidelines.

Ethical approval for the study was obtained from the Ethical Review Board of Rawalpindi Medical University & Allied Hospitals (Ref No. R-01/RMU/19) and formal approvals for data collection were taken from heads of all health facilities. The data were collected from the hospital records and log sheets and no identifying information was collected or questionnaire was administered.

RESULTS

Table 2 shares the findings of the pooled data from all three hospitals. Results showed that 2255 cesarean sections were performed out of 5657 deliveries carried out in all four units of participating three hospitals during the study period giving an overall CS rate of 39.9%. Women in Group 3 (Multiparous women without previous CS, singleton, cephalic ≥ 37 weeks' gestation, in spontaneous labour), made the largest contribution to the obstetric population accounting for 26.3% of all deliveries. This was followed by Group 5 (previous cesarean section, singleton, cephalic, ≥ 37 gestation) and Group 10 (all women with single cephalic pregnancy before term, including those with previous CS) which accounted for 18.7% and 17.2% respectively.

Table-2: Robson's Classification Report Table data for all three tertiary care hospitals of Rawalpindi, Pakistan

Group	No of CS in Group	Total women in the group	[a]Group size (%)	[b]Group CS rate (%)	[c]Absolute group contribution to overall C/S rate (%)	[d]Relative contribution of group to overall CS rate (%)
1	152	940	16.6	16.2	2.7	6.7
2	286	492	8.7	58.1	5.1	12.7
2a	88	293	5.2	30.0	1.6	3.9
2b	198	199	3.5	99.5	3.5	8.8
3	78	1485	26.3	5.3	1.4	3.5
4	115	322	5.7	35.7	2.0	5.1
4a	20	227	4.0	8.8	0.4	0.9
4b	95	95	1.7	100.0	1.7	4.2
5	941	1057	18.7	89.0	16.6	41.7
5.1	487	600	10.6	81.2	8.6	21.6
5.2	454	457	8.1	99.3	8.0	20.1
6	85	100	1.8	85.0	1.5	3.8
7	127	159	2.8	79.9	2.2	5.6
8	54	99	1.8	54.5	1.0	2.4
9	28	28	0.5	100.0	0.5	1.2
10	389	975	17.2	39.9	6.9	17.3
Total #	**2255**	**5657**	**100.0**	**39.9**	**39.9**	**100**

aGroup size (%) = n of women in the group/total n women delivered in the hospital × 100.
bGroup CS rate (%) = n of CS in the group/total n of women in the group × 100.
cAbsolute contribution (%) = n of CS in the group/total n of women delivered in the hospital × 100.
dRelative contribution (%) = n of CS in the group/total n of CS in the hospital × 100.
#These totals and percentages come from the data in the table

Analysis shows that almost 76% of the women were classified into groups 1 through 5 according to the Robson classification manual.[17] Nearly one quarter of the women were categorized in Group 1 and 2, with a group ratio of 2:1. Group size 3 & 4 was found to be 32%. The ratio of group 3 to 4 is roughly 5:1, shows very low induction rates. CS rates in group 4 are further distributed in 4a and 4b. Women in group 5 (previous CS) constituted about 18.7% of the obstetric population. Among these women, 10.6% reported having had one CS while the remaining (8.1%) had two or more CS. The size of group 6 and 7 (breech fetuses) was 4.6%, group 8 (multiple pregnancy) was 1.8% while 17.2% of the women were categorized in Group 10. The CS rate in group 9 was 100%. The CS rates in both the groups 5.1 and 5.2 (women with previous scars) were high being 81.2 % and 99.3% respectively. Group 6 to9 presented high rates of CS due to obstetric conditions, but the contribution of these groups to the overall CS rate was smaller (13%

of total CS rate) due to the relatively small size of these groups. The largest contributors to the overall CS rate were Group 5 (41.7 %), Group 10 (17.3%) and Group 2 (12.7%). These three groups contributed to about 72% of all cesarean deliveries.

A comparison of CS rates as per Robson classification by each health facility is shown in figure 1. The bars in the graph represent the upper proportion limit of CS rates in each of the Robson groups as per Robson guideline, while each colored dot represents different gyne/obs units in the three hospitals. Our analysis shows that the overall CS rate in the three hospitals ranged between 34–45.3%. Groups 1 to 5 and group 10 showed CS rates higher than the Robson's recommended rates in all 4 units/hospitals, with the highest rates reported in group 2, 4 and 5 from hospital B.

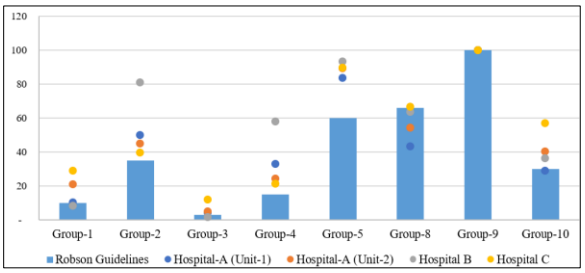

Figure-1: Comparison of CS rate in the among three hospitals as per Robson classification system

Note: Groups 6 &7 not included in Robson reference mainly based on local clinical management guidelines for breech deliveries.

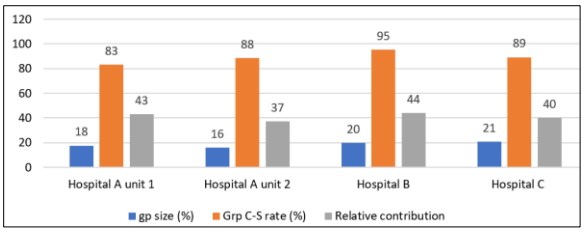

Figure-2: Comparison of Group 5 (previous cesarean section, singleton, cephalic, ≥ 37 gestation) among all three hospitals

In the aggregated data of all hospitals, the size of group 5 is just 18.4% of total deliveries (range (16–21%) but the group CS rate was the highest among all groups 89% (range 83–95%). Relative contribution to overall CS rate ranged from 37–44% (Figure-2).

DISCUSSION

This study described the process of implementation of "Robson's Ten Groups Classification System"[17] and its importance for optimisation and analysis of CS rates in tertiary care hospitals. In the present study, the overall CS rate was found to be 39.9%, which is more than double of what is considered an optimal rate of CS, and is much higher than the 22%, which is reported by PDHS 2017-2018. The high CS rates could be explained by the fact that data were collected from tertiary care hospitals that mostly receive referrals of patients with bad obstetric history from various primary and secondary health facilities of the adjoining districts. Thus although high, the CS rates found in this study findings are consistent with studies conducted in tertiary care hospitals.[18–20]

In this study, the proportion of women categorized in Group 3 (multiparous), Group 5 (previous Csection), and Group 10 (Preterm) was comparatively high. A large contribution of population from these three groups can be attributed to fact that all study sites are tertiary care hospitals offering better management and treatment for high risk pregnancies and have advanced facilities such as; ICUs for mother and newborn, availability of blood banks and highly skilled surgical expertise. Similar findings were reported in other studies.[15,21–23] At the sametime the largest contributors to the overall CS rate were; Group 5 (41.7 %), Group 10 (17.3%) and Group 2 (12.7%), contributing to nearly 72% of all cesarean deliveries, which is in concurrence with findings from similar studies (24,25). Group 5 (previous CS) is found to be the largest contributor to the overall CS rate. Among these women, 10.6% had one, while 8.1% had two or more CS. Multiple reasons such as an increased number of first CS in nulliparous women, local hospital policies regarding trail of labour after C-section and obstericians reluctance for Vaginal Birth after CS (VBAC) etc., could have led to a higher size of group 5. While vaginal birth after C-section (VBAC) is not completely risk free because of adverse maternal and perinatal morbidities related to uterine rupture,[24] evidence suggests that given a careful selection of canditates, a trial of labour is a safe choice, with risks of adverse perinatal outcomes similar to those in Group 1 (nulliparous with single fetus)[25]. To optimize the number of CS in this group should focus on a careful selection of women especially those with a single CS previously for a trial of labour and monitoring using partograph/labour guide. It is important to educate women and address fears regarding uterine rupture associated with VBAC.[21] The effort to reduce the overall CS rate should be directed not only to increase VBAC but also to optimize the first CS in reducing size of group 5.[27] Targeting this group will have the greatest impact of overall CS rates as shown by similar studies from South Asia.[28,29]

Group 10 (Preterm cephalic), was found to be the third-largest group and the second largest contributor to CS rates. The same reasons of being tertiary level hospitals that receive high proportion of pregnancies with major obstetric and medical comorbidities such as hypertensive disorders of pregnancy, fetal distress, intrauterine growth restriction, preterm labour or preterm rupture of membrane etc., could explain the high contribution of this group to the overall CS rates. The high CS rate in this group suggest the possibility of pre-

labor CS for preventing maternal and fetal morbidities and mortalities as shown in previous research.[15,23] Robson guidelines suggest an optimum proportion of 35–42% for group 1 and 2, while our study reported much lower numbers indicative of a lower number of nulliparous woman in our study. Further, the CS rate for group 2A (nulliparous induced) was nearly twice of Group 1 (nulliparous spontaneous), indicating high induction of labour followed by failure of induction in nulliparous women and ultimately leading to a CS. This necessitates the improvement of labour induction practices such as selection of induction method, standard operating procedures (SOPs) for induction and clear definition of failure of induction for optimising CS rates among nulliparous women[29,30]

Intrapartum care of low-risk women (nulliparous/multiparous women with single cephalic pregnancy and no previous CS) is considered to be a key indicator of obstetric care in a hospital. In our study, CS rates in low risk women were high than expected range of Robson guidelines. On the other hand, women with certain obstetric risk factors (groups 6–9) i.e., breech presentation, multiple pregnancy, or transverse lie etc., aren't significant contributors to CS rates as the relative sizes of these groups are consistently small in our study. As a result, our study shows a surge in CS is primarily due to low-risk pregnancies, rather than high-risk pregnancies.[31]

A few limitations of the study need to be considered. The study is conducted in tertiary care facilities which have a high influx of referral cases from primary and secondary health facilities of the adjoining districts. Since the study did not collect data maternal and perinatal outcomes and also the specific indications of CS, we are unable to comment on whether these rates are optimal for these institutions. Thus the CS rates seen in this study cannot be extrapolated to other health facilities in the country.

Despite these limitations, our study has shown that that Robson TGCS is a useful tool to study CS rates and should be used on a regular basis to assess the overall trends in CS rates. To address the high CS rates, there is a need to implement universally acceptable standards and audit mechanism,to check rates for caesarean sections, without compromising maternal or foetal safety. Robson TGCS should be introduced into all secondary and tertiary level health facilities and a regular monitoring/audit should be conducted as part of part of the regular MNCH system. Education and awareness should be made an integral part of ANC education with specific focus on the advantages and disadvantages of CS. Further, health service providers should also be provided awareness on the burden imposed by unnecessary CSs on the health system.

CONCLUSION

Our study reported, a CS rate of 39.9%, which is much higher than the WHO recommended optimal rate of CS. We found that Group 5 (previous CS) is found to be the largest contributor to the overall CS rate. The nulliparous induced women had a higher CS rate compared to the nulliparous women in spontaneous labor. Group 10 (Preterm cephalic), was found to be the third-largest group and the second largest contributor to CS rates. We conclude that Robson TGCS is a useful tool to study CS rates and the approach used in this study can be used as a model for institutionalizing RTGCS in other secondary and tertiary level health facilities in Pakistan.

Data availability:

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of interest:

There are no conflicts of interest for any author of this manuscript.

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AUTHORS' CONTRIBUTION

Conceptualization and design: Rizwana Chaudhri, Kauser Hanif, Humaira Bilqis, Tahira Ezra Reza, Qudsia Uzma, Atiya Aabroo, Faran Emmanuel Overall study oversight: Rizwana Chaudhri, Kauser Hanif, Humaira Bilqis, Tahira Ezra Reza, Management of data collection: Tahira Ezra Reza, Kauser Hanif Data cleaning: Tahira Ezra Reza, Kauser Hanif Data analysis: Tahira Ezra Reza, Fazal Ur Rehman Writing draft manuscript: Kauser Hanif, Ammarah Khan Critical revisions of the manuscript: All authors Final approval of the manuscript: All authors.

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