CORRESPONDENCE

Dr Alish Shrestha

Paropakar Maternity and Women's Hospital, Thapathali, Kathmandu, Nepal

Email: alishsth2011@gmail.com; Phone: +977-9849852085

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Robson Ten Group Classification System and fetal distress as the indication for cesarean section

Alish Shrestha, Gehanath Baral, Beemba Shakya
Paropakar Maternity and Women's Hospital, Thapathali, Kathmandu

ABSTRACT

Aim: To determine the association of Robson ten group classification system (RTGCS) and the fetal distress as an indication of CS among women delivering in Paropakar Maternity and Women's Hospital.

Methods: This was an observational cross-sectional study over a period of 6 months. 410 study sample population undergoing CS were stratified according to RTGCS out of total of 11575 women's delivering in PMWH and were analysed for indication of CS, fetal distress, maternal and fetal complications and their distribution according to RTGCS.

Results: Overall CS rate was 35.08%. Largest group size was of group 1 with 4131 patients (35.69%) followed by group 3 with 2980 patients (25.75%). Highest contribution to CS rate was from group 5 (1070 patients, group CS rate 99.17% and contribution to overall CS rate 26.35%). Group 1 and 2 had low group CS rate in comparison to other groups but it was still higher than the Robson guidelines and MCS reference population as per WHO implementation guidelines. On analysis of sample study population CS rate due to fetal distress was 28.54% and previous CS was 25.85%.

Conclusions: High proportion of women gave birth via CS among which high contribution was by low risk groups. The major indication of CS in low risk groups was fetal distress and there was significant rise of fetal distress after admission. Hence RTGCS neither could predict the indication of CS nor could correctly identify the actual high risk group. Hence incorporation of more objective indication of CS like fetal distress or high risk diagnosis which gives rise to fetal distress, in RTGCS criteria is recommended.

Keywords: cesarean section, fetal distress, indication, Robson classification

INTRODUCTION

There is rise in cesarean section (CS) rates in the past few decades, not only in developed countries but also in developing countries. The World Health Organization (WHO) states that CS rates should be between 10% and 15%.[1] This rise in CS rate is due to the rise in number of women with previous CS, increased use of electronic fetal monitoring which in turn identifies more cases as fetal distress. Robson Ten Group Classification System (RTGCS) is used to analyze the CS and to classify them to various groups and identifies the group with high (CS) percentage and is appropriate for long term tracking and international comparison of this increase in cesarean section trend.[1,2]

Hence, this study was focused to find out the frequency and indications of CS and analyze them to know the significant contributors to rise in cesarean section rates using RTGCS, and to analyze whether or not RTGCS can accurately predict the CS burden.

METHODS

It was a cross-sectional observational study conducted at Paropakar Maternity and Women's Hospital (PMWH) during 15th June to 14th December, 2020. Total women delivering during this time

were classified according to RTGCS and Robson Classification report table was prepared and compared with Robson guideline and WHO MCS population.[3]

Real time unpublished hospital data prior to study were used to calculate the sample size[4,5] such as 29% CS rate, 650 per month and 204 fetal distress per month.

Where,

P= Estimated proportion of expected ('quality')[6,7]

CS out of observed rate in percentage = 15%/29% = 0.517

Q=1-P

T= Number of population as a clinical group (CS) taken to draw inferences from specified period of time = average 15 CS/day x 7 days in a week = 105/Week

Z=constant for a 95% level of confidence = 1.96

D =Required range of error in accuracy = 5%

$$N = \frac{z^2TPQ}{D^2T + z^2PQ}$$

$$= \frac{1.96^2 \text{x} 105 \text{x} 0.517 \text{ x} 0.483}{(5\%^2 \text{x} 105 + 1.96^2 \text{x} 0.517 \text{x} 0.4\,83)}$$

$$= \frac{100.72}{(0.26 + 0.96)} = \frac{100.72}{1.22} = 82$$

Because of high obstetric load in the study site five-multiples of calculated sample size was taken. Thus, Sample = 5x82 = 410. Pregnant women of all age group and parity undergoing caesarean sections were taken after the gestational age of 20 weeks. Data were collected according to the recommended flow chart. (Figure-1)

Obtained Data was entered using Microsoft Excel version 2010 and was analysed using IBM SPSS version 16. Chi square test was used to determine any association between variables with significance level at 5% ($p<0.05$ considered to be statistically significant).

Data were assessed according to the RTGCS report table (Table-1).[3]

Table-1: Robson classification report table

Assessing type of population using the Robson Classification Report Table[3]						
1	2	3	4	5	6	7
Group	Number of CS in group	Number of women in group	Group Size[1*] (%)	Group CS rate[2*] (%)	Absolute group contribution to CS rate[3*] (%)	Relative contribution of group to overall CS rate[4*] (%)

[1*]Column 4= Group size (%) = n of women in the group / total N women delivered in the hospital x 100

[2*]Column 5= Group CS rate (%) = n of CS in the group / total N of women in the group x 100

[3*]Column 6= Absolute contribution (%) = n of CS in the group / total N of women delivered in the hospital x 100

[4*]Column 7= Relative contribution (%) = n of CS in the

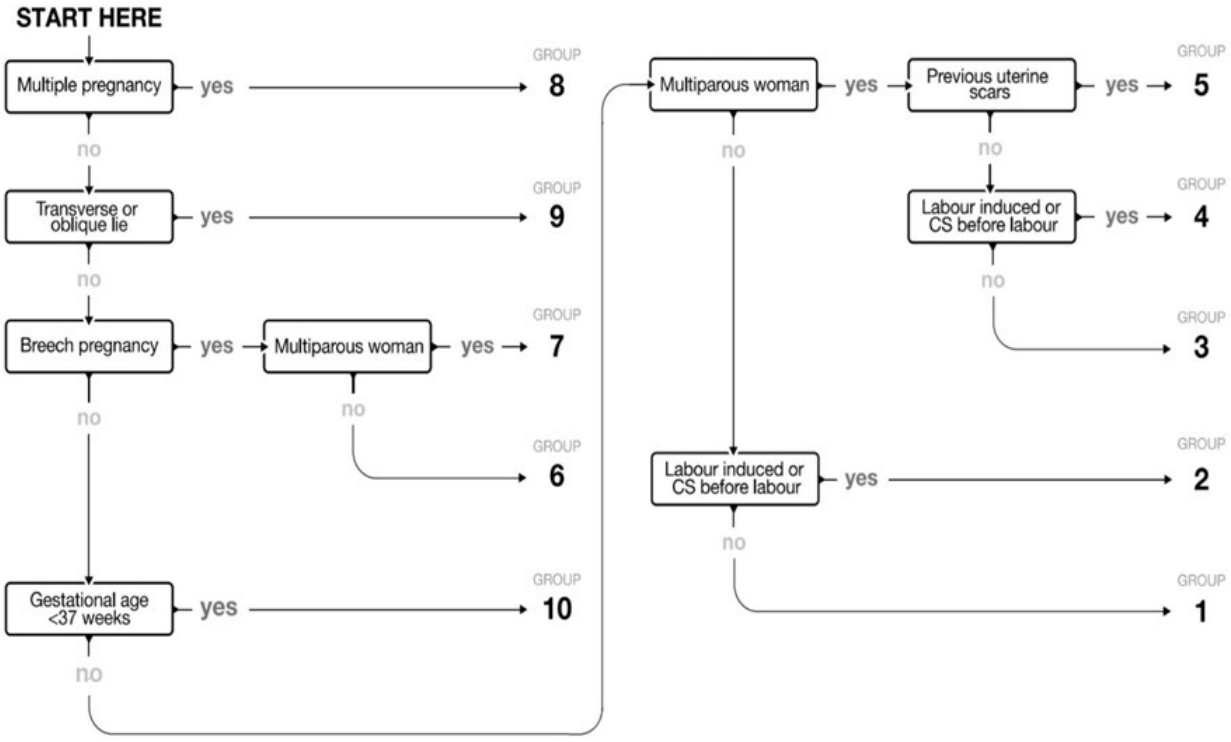

Figure-1: Data collection flow chart

RESULTS

During the study period of 6 months, 11575 deliveries occurred in this hospital out of which 4061 patients (35.08%) underwent CS and 7514 (64.91%) patients delivered vaginally.

Largest population belonged to group 1with 4131 patients (35.69%) followed by group 3 with 2980 patients (25.75%). Highest contribution to CS rate was from group 5 (1070 patients, group CS rate 99.17%, and contribution to overall CS rate 26.35%). [Table-2]

Table-2: Robson Classification Report Table prepared from total population

RTGCS	Total population of women undergone CS	Total population of women delivered	Group size%	Group CS rate%	Absolute group contribution to CS rate%	Relative contribution of group to overall CS rate %
1	1002	4131	35.69	24.26	8.66	24.67
2a	466	1290	11.14	36.12	4.03	11.48
2b	480	480	4.15	100.00	4.15	11.82
3	300	2980	25.75	10.07	2.59	7.39
4a	72	650	5.62	11.08	0.62	1.77
4b	180	180	1.56	100.00	1.56	4.43
5	1070	1079	9.32	99.17	9.24	26.35
6	134	136	1.17	98.53	1.16	3.30
7	110	135	1.17	81.48	0.95	2.71
8	50	53	0.46	94.34	0.43	1.23
9	10	10	0.09	100.00	0.09	0.25
10	187	451	3.90	41.46	1.62	4.60
Total	4061	11575	100.00			100.00

On evaluation of 410 sample patients enrolled in study; the mean age of the patients included in study was 26.66years±SD 4.9years, and had other parameters have been presented. [Table -3]

Table-3: Distribution of cases by obstetric parameters

Parameters		N	%
Age Group	15-24years	150	36.59%
	25-34years	230	56.10%
	≥35years	30	7.31%
Weeks of Gestation	<32weeks	5	1.22%
	32 - <37weeks	39	5.91%
	37 - <42weeks	362	88.29%
	≥42weeks	4	0.98%
Anc Visits	<4	191	46.58%
	≥4	183	44.64%
	Unbooked	36	8.78%
Gravidity	Primigravida	179	43.66%
	G2	155	37.80%
	G3	51	12.44%
	G4	16	3.90%
	≥G5	9	2.2%
Parity	P0	211	51.46%
	P1	160	39.03%
	P2	33	8.06%
	P3	5	1.21%
	≥P4	1	0.24%

Parameters		N	%
Abortion	A1	60	77.93%
	A2	11	14.27%
	≥A3	6	7.80%
Fetus order	Single	406	99.02%
	Multiple	4	0.98%
Lie Of Fetus	Longitudinal	403	98.29%
	Oblique	1	0.24%
	Transverse	4	0.98%
	Unstable	2	0.49%
Presentation	Cephalic	377	91.95%
	Breech	29	7.07%
	Compound	2	0.49%
	Cord	2	0.49%
Type Of Labour	Spontaneous	192	46.83%
	Induced	61	14.88%
	Not In Labor	157	38.29%
Past Cs	Yes	128	31.22%
	No	282	68.78%
Past CS#	1	123	96.10%
	≥2	5	3.90%

On classifying according to RTGCS; 95 (23.17%), 82 (20%), 31 (7.56%), 20 (4.88%), 113 (27.56%), 17 (4.14%), 12 (2.93%), 4 (0.98%), 4 (0.98%) and 32 patients (7.80%) belonged to the group 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 respectively.

Group 1 and 2 (nulliparous, term, single, cephalic, spontaneous or induced labor) which are low risk group had highest contribution to CS rate i.e. 177 patients (43.17%) which is followed by group 5 i.e. 113 patients (27.56%). One hundred and four patients (25.36%) had previous CS as indication at admission, 75 patients (18.29%) were in LPOL during admission, 48 patients (11.70%) were postdated pregnancies admitted for induction of labor. [Figure-2]

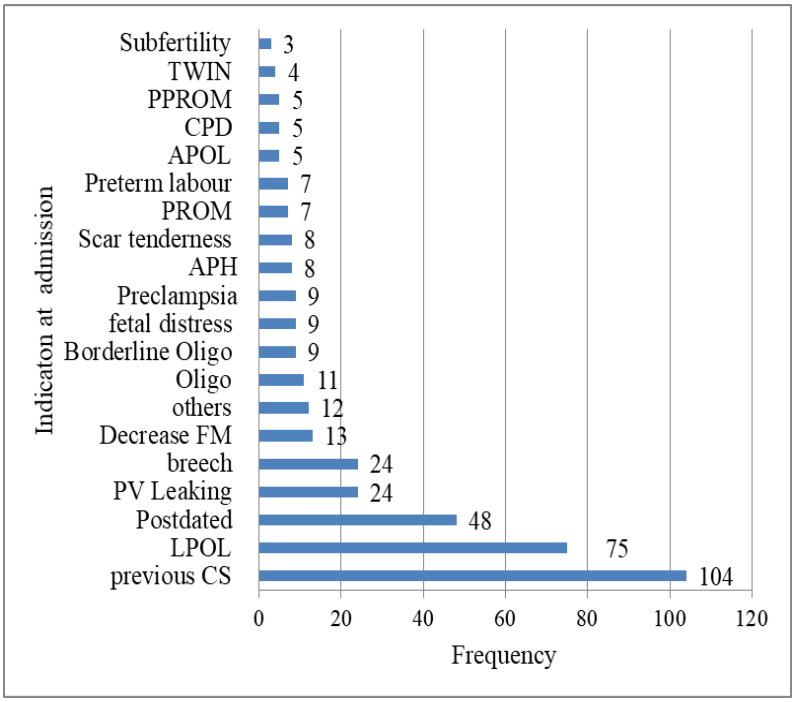

Figure-2: Distribution of patients according to indication at admission

One hundred and seventeen (28.54%) had fetal distress as indication of CS followed by previous CS (106; 25.85%), CPD (36; 8.78%) and oligohydraminos (30; 7.31%). [Figure-3]

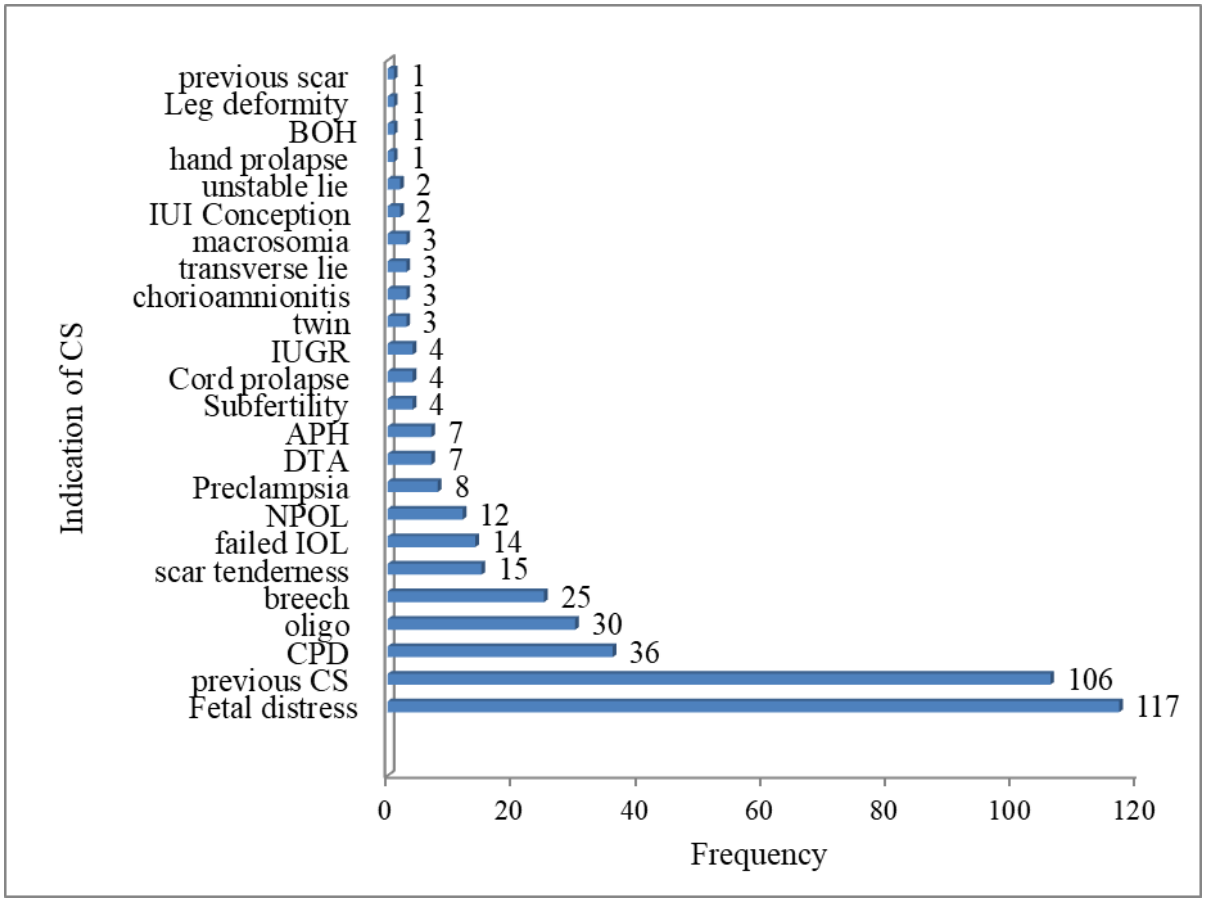

Figure-3: Distribution of patients according to indication of CS

Out of 410 patients, 9 patients had fetal distress at admission diagnosis, 6 patients (66.66%) from group 1 and 2 patients (22.22%) from group 2. One hundred and seventeen patient had fetal distress as primary indication of CS of which 44 patients (37.61%) belonged to group 1, 26 patients (22.22%) belonged to group 2a and 22 patients (18.80%) belonged to group 3.

Low risk group (RTGCS 1,2a, 2b) were found to have statistically significant rise in rate of fetal distress after admission ($p<0.005$). Also these groups had statistically significant relationship with fetal distress as indication for CS when compared to other group ($p<0.005$). [Table-4]

Table-4: Comparison of low risk (Group 1,2a, 2b) and non-low risk group for fetal distress as indication of CS

	Fetal distress evolved after admission		Total	p-value
	yes	no		
Low risk	71	106	177	
Non- Low risk	37	196	233	<0.005
Total	108	302	410	

	Fetal distress as primary indication of CS		Total	p- value
	Yes	No		
Low risk	77	100	177	
Non- Low risk	40	193	233	<0.005
Total	117	293	410	

Out of 410 patients, 79 patients (19.27%) had maternal complications. Most common complication being PPH with 53 patients (12.93%), followed by GHTN with 23 patients (5.61%) and blood transfusion with 21 patients (5.12%). Nineteen patients (45.24%) from group 2a, 12 patients (12.63%) from group 1 and 11 patients (9.73%) from group 5 had maternal complications. [Figure-4]

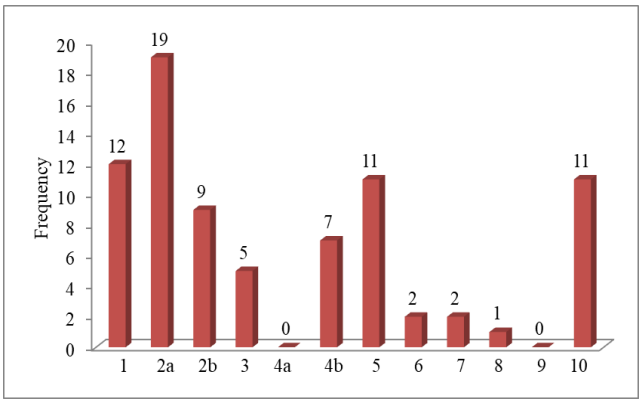

Figure-4: Distribution of patients according to maternal complication along RTGCS

DISCUSSION

Cesarean section rate was 35.08% similar rates (30%-40.1%) of CS were shown by four other studies.[8–11] .Largest group size was group 1 which had second highest contribution to overall CS result; similar results were obtained in eleven more studies.[9–19] Group 5 had highest contribution to CS rate, similar results were shown by thirteen more studies.[8,10,12–22]

Group 6, 7, 8, 9 and 10 had relatively smaller group sizes (1.17%, 1.17%, 0.46%, 0.09% and 3.90% respectively); and smaller contribution overall CS rates (3.30%, 2.71%, 1.23%, 0.25% and 4.60% respectively) but had higher group CS rates (98.53%, 81.48%, 94.34%, 100.00% and 41.46% respectively) similar findings were seen in eight more studies.[9,13–17,20,22] The findings and their interpretation related to the data quality, the type of population and the CS rates can be summarized. [Table-5]

Table-5a: Assessment of quality of data using the Robson Classification Report Table of obtained from our study.

Steps	Interpretation by Robson[3]	MCS population[3]	This study	Further Interpretation[3]
1. the total no. of CS and of women delivered (last lines of Column 2 and Column 3)	These numbers should be identical to the total number of CS and of women delivered	NA	Identical	Data is correct and nothing is missing, rare possibility of misclassification
2. the size of Group 9 (Column 4)	It should be less than 1%.	0.4%	0.09%	Rate in line with both Robson references and MCS examples. No misclassification
3. the CS rate of Group 9 (Column 5)	It should be 100%	88.6%	100%	Rate in line with Robson references.

Table-5b: Assessment of type of population using the Robson Classification Report Table obtained from our study

Steps	Interpretation by Robson[3]	Example: MCS population[3]	This study	Further Interpretation[3]
1. the size of Groups 1 + Group 2 (Column 4)	This usually represents 35-42% of obstetric population	38.1%	50.43%	high proportion of women who have only one child rather than more than one child
2. the size of Groups 3 + 4 (Column 4)-	This usually represents about 30% of women.	46.5%	32.93%	A bit higher proportion of women with more than one child rather than only one child, the size of Groups 3 + Group 4 will be higher than 30%
3. the size of Group 5 (Column 4)	It is related to the overall CS rate. The size of Group 5 is roughly usually about half of the total CS rate.	7.2%	9.32%	Relatively normal or lower rate of CS in past decades in group 1 and 2
4. the size of Groups 6 + 7 (Column 4)	3-4%	2.7%	2.34%	Rate in line with Robson MCS examples. Lower rate of preterm deliveries
5. the size of Groups 8 (Column 4)-	It should be 1.5 -2%	0.9%	0.46%	probably a lot of the twins are referred out
6. The size of Groups 10 (Column 4)	It should be less than 5% in most normal risk settings	4.2%	3.9%	Rate in line with both Robson references and MCS examples with high group CS rate (41%) suggest more iatrogenic preterm CS conditions
7. The Ratio of the size of Group 1 versus Group 2 (Column 4)	It is usually 2:1 or higher	3.3	2.33	Rate in line with both Robson references and MCS examples suggesting correct data collection
8. The Ratio of the size of Group 3 versus Group 4. Column 4)	It is always higher than the ratio of Group 1/ Group 2 in the same institution, i.e., larger than 2:1	6.3	3.59	Rate in line with both Robson references and MCS examples. Confirms reliable quality of data
9. The Ratio of the size of Group 6 versus Group 7. (Column 4)	It is usually a 2:1 because breeches are more frequent in nulliparous women than in multiparous women.	0.8	1	Similar to MCS reference population

The manual for interpretation of CS rates stated that the size of group 9 should be less than 1% of the total and the CS rate should be 100% for this group.[3] In this study, the size of group 9 was 0.09% and the CS rate in this group was 100%, suggesting minimal misclassification in this group, similar results were seen in eight other studies.[9,13–17,20,22]

Several other indicators were in line with the comparison populations given in Robson's manual; the proportion of group 5, size of group 6+7, proportion of Groups 10, the ratio of the size of Group 1 versus Group 2 and the ratio of the size of Group 3 versus Group 4 suggesting correct data collection with confirmation in reliability of data.[3] Ratio of group 6 to 7 was lesser than given by Robson guideline but was similar to MCS example reference population.[3] four other studies had similar interpretation.[10,14,15,22]

According to Robson, the proportion of group 5 should be at least half of the entire CS rate. However, in this study the proportion of group 5 represents only 9.32% which reflects a low CS rate in previous years. Similar results were shown by 3 more studies.[8,10,22]

The CS rate in Robson group 1 was 24.26%, which is much higher than Robson's examples showing that rates under 10% are achievable.[3] This reflects a selection among nulliparous, where many normal spontaneous deliveries take place but as this study was conducted in tertiary center with burden of referred in cases

Table-5c: Assessment of CS rates using Robson report table obtained from our study.

Steps	Robson guideline[3]	MCS reference population[3]	This study	Further Interpretation[3]
1. CS rate for Group 1 (Column 5)	Rates under 10% are achievable	9.8%	24.26%	Due to larger group size , rates under 10% is unachievable
2. CS rate for Group 2 (Column 5)	Consistently around 20-35%	39.9%	53.44%	High rate of CS in group 2 with relatively smaller size of group 2b indicated poor success rates for induction or poor choice of women to induce and consequently a high rate of CS in Group 2a.
3. the CS rate for Group 3 (Column 5)	Normally, no higher than 3.0%.	3%	10.07%	High rate of CS with non-absolute indication of CS
4. CS rate for Group 4 (Column 5)	It rarely should be higher than 15%	23.7%	30.03%	Due to larger size of group 2b, lesser rate of induction in multiparous women h/o of previous complicated vaginal deliveries
5. CS rate for Group 5 (Column 5)	Rates of 50-60% are considered appropriate provided you have good maternal and perinatal outcome.	74.4%	99.17%	Due to a policy of scheduling pre-labor CS for all women with 1 previous scar without attempting a trial of labor.
6. the CS rate for Group 8 (Column 5)	It is usually around 60%.	57.5%	94.34%	Variations due to type of twin pregnancy.
7. CS rate in Group 10 (Column 5)	In most populations it is usually around 30%	25.1%	41.46%	It is usually due to many cases of high risk pregnancies (e.g. fetal growth restriction, preeclampsia) that will need preterm prelabor CS as ours is a referral center
8. Relative contribution of Groups 1, 2 and 5 to the overall CS rate	contribute to 2/3 (66%) of all CS.	63.7%	74.32%	These three groups should be the focus of attention if the hospital is to lower the overall CS rate.as the overall CS rate is high, the greater the focus should be in Group 1.
9.Contribution of Group 5 to the overall CS rate (Column 7)		28.9%	26.35%	Normal or low rate of CS in group 1 and 2 in past decade

also it reflects a low 'threshold' interpreting criterion for a CS with high rate of CS for non-absolute indication of CS. Similar results were seen in twelve other studies.[9,10,20,22,11–16,18,19]

The CS rate in group 2 was also higher (55.44%) than Robson's guideline.[3] Population in group 2b was relatively smaller indicating poor success rates for induction or poor choice of women to induce and consequently a high rate of CS in Group 2a and hence high rate in group 2. Similar interpretations were made in six more studies.[8,9,13,18,20,21] This reflects that the threshold for deciding on doing CS is too low, and this could had happened due to extremely busy labor wards where CS maybe preferred over a time-consuming trial of labor.

This 'low' CS threshold may explain why group 3 also had a higher CS rate (10.07%) than the comparison population (3%–5%).[3] Similar results were shown by 4 other studies.[13,16,18,20]

Robson guideline stated that the CS rate in group 4 is rarely should be higher than 15%, while in our study this rate was much higher (30.03%).[3] This might be because of the high CS rate group 4b (21.68%), which contributed to the high overall CS rate in group 4. This was due to lower rate of IOL in multiparous patients and high rate of CS in women with history of previous complicated deliveries.

The CS rate in group 5 in this study was 99.17 % which is higher than the Robson guideline (50%–60%) as well as WHO MCS reference population[3] similar results were shown by seven other studies.[10–13,15,17,22] This might be due to a policy of scheduling pre-labor CS for all women with 1 previous scar without attempting a trial of labor or too few women were offered a trial of labor after having had previous CS.

According to Robson guidelines rate of CS in group 10 is around 30%[3] in this study it was around it was much higher (41.46%) this might be explained by the fact that PMWH is a tertiary hospital with high referral case burden of complicated pregnancies with maternal medical indications leading preterm CS. Similar results were seen in four different studies.[10,13,17,22]

The examples given by Robson in his guideline stated that nulliparous and women with a previous CS contribute to 66% of CS at the hospital, comprising group 1 group 2 and group 5.[3] In this study, the relative contribution of these three groups (group 1, 2 and 5) to the overall CS rate was 74.32%.which is slightly higher may because the group size of 1 and 2 are larger. Similar results were shown by eight other studies.[8,9,11,13,14,17,20,22]

The overall CS rate in our hospital (35.08%) is higher than the WHO recommendation 10%–15%.[3] Similar results were shown by many other studies.[7,8,18–22,9,10,12–17] The high CS rate in this study had many factors; like PMWH is a tertiary center with high burden of referred and complicated pregnancy cases, high rate of iatrogenic preterm CS, low threshold for CS in low risk group, provision of scheduling CS without trial of labor for patients with previous CS and as this is a teaching hospital under NAMS and has doctors under specialist training performing CS.

Most of patients (56.1%) belonged to age group of 25 to 34years. Similar results were shown by six different studies.[8,9,13,18,19,22] Major proportion of patients enrolled in study were primigravida (43.66%). More than half were nulliparous (51.46%) and more than one third had parity 1 (39.03%). Except for few patients all most all of sample population (99.02%) had singleton pregnancy, more than 90% had longitudinal lie with cephalic presentation. More than 3/4th of the sample populations were admitted at term pregnancy (37 to 42weeks). Majority of patients had spontaneous onset of labor at admission (46.83%) more than one third were not in labor (38.29%) whereas only 14.88% underwent IOL suggesting high rate of pre-labor indications of CS and low threshold for CS at our study site. Around one third of patients had history of previous CS (31.22%).

On classifying sample population according to RTGCS it was found that group 1 ,2 and 5 in combination contributed 70.73% to overall CS rate similar to the total population during study. Hence the sample population (patients enrolled in the study) represented the total population.

On study of indication for admission sample population, it was found that 25.36% patients were admitted for previous CS status, 18.29% patients were in LPOL and 11.70% patients were postdated pregnancies admitted for induction of labor. But majority of patient underwent CS for indication of previous CS status (25.85%) and fetal distress as indication of CS (25.54%). Similar indications have been reported in multiple other studies.[11–13,16,17,19,23,24]

Among patients underwent CS for fetal distress 65.43% belonged to group 1 and 2 (low risk group). Statistically significantly relation was found between fetal distress as indication for CS among low risk group also these groups had statistically significant rise of fetal distress after admission. High contribution to CS rate it is due to large group size as group CS rate is comparatively lower when compare to other groups and more than 3/4th of patients form these groups delivered vaginally .

This high proportion and rise of fetal distress as indication for CS might be due to non-optimal fetal monitoring, misdiagnosis of abnormal fetal heartbeat pattern, lack of watchful management of progression of labor and low threshold for CS. In this scenario misleading criteria of group 1 and 2 from RTGCS might lower the threshold of CS even more and increase rate of CS due to higher anticipation of CS in low risk group.

Highest rate of maternal complication was seen in group 2 (67.74%), more than half of overall maternal complications were contributed by group 1and 2 (15.9% and 35.44% respectively). These high rates of complication in low risk group also suggest towards need to decrease CS rate in these groups.

CONCLUSIONS

Low risk group had higher contribution to overall CS rate. Major indication for CS was fetal distress and significant rise of fetal distress after admission was seen in these group but this indication isn't mentioned in criteria of RTGCS, hence RTGCS couldn't predict indication of CS properly for these low risk group and falsely drew attention towards these group with higher than required anticipation of CS. Also vague criteria of group 1 and 2 without any mentioning of high risk indication like fetal distress shows the limitation of RTGCS in predicting CS in low risk group.

According to Robson guidelines rate of CS in group 10 is around 30%[3] in this study it was around it was much higher (41.46%) this might be explained by the fact that PMWH is a tertiary hospital with high referral case burden of complicated pregnancies with maternal medical indications leading preterm CS. Similar results were seen in four different studies.[10,13,17,22]

The examples given by Robson in his guideline stated that nulliparous and women with a previous CS contribute to 66% of CS at the hospital, comprising group 1 group 2 and group 5.[3] In this study, the relative contribution of these three groups (group 1, 2 and 5) to the overall CS rate was 74.32%.which is slightly higher may because the group size of 1 and 2 are larger. Similar results were shown by eight other studies.[8,9,11,13,14,17,20,22]

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This high proportion and rise of fetal distress as indication for CS might be due to non-optimal fetal monitoring, misdiagnosis of abnormal fetal heartbeat pattern, lack of watchful management of progression of labor and low threshold for CS. In this scenario misleading criteria of group 1 and 2 from RTGCS might lower the threshold of CS even more and increase rate of CS due to higher anticipation of CS in low risk group.

Highest rate of maternal complication was seen in group 2 (67.74%), more than half of overall maternal complications were contributed by group 1and 2 (15.9% and 35.44% respectively). These high rates of complication in low risk group also suggest towards need to decrease CS rate in these groups.

CONCLUSIONS

Low risk group had higher contribution to overall CS rate. Major indication for CS was fetal distress and significant rise of fetal distress after admission was seen in these group but this indication isn't mentioned in criteria of RTGCS, hence RTGCS couldn't predict indication of CS properly for these low risk group and falsely drew attention towards these group with higher than required anticipation of CS. Also vague criteria of group 1 and 2 without any mentioning of high risk indication like fetal distress shows the limitation of RTGCS in predicting CS in low risk group.

The group CS rates were higher for low risk group in comparison to MCS reference population and Robson guidelines significantly due to fetal distress; indicated towards high proportion of misdiagnosis of fetal distress and low threshold for CS in these group. Hence improving fetal heartbeat-monitoring system, proper CTG interpretation focused on appropriate diagnosis of non-reassuring pattern to decrease the misdiagnosis of fetal distress and incorporation of "fetal distress" or condition which gives rise to fetal distress into RTGCS are recommended to decrease the burden of CS in these low risk groups.

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