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Research Article
Robson Ten Group Classification System for Analysis of Cesarean Sections in an Indian Hospital

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Abstract

Background and Aim: Cesarean section (CS) is the most commonly performed life-saving procedure. However, CS is associated with its own risks for maternal and perinatal morbidity and mortality in present as well as subsequent pregnancies. There is increase in cesarean section rates globally. Cesarean section audits are an important tool to understand and make recommendations for a possible reduction in cesarean delivery rates. Hence, the current study analyzed leading groups contributing to high cesarean section rates at a teaching hospital, by using Robson's Ten Group Classification System (RTGCS). **Materials and Methods:** The present study was conducted in the Department of Obstetrics and Gynecology at teaching hospital attached to KLE Academy of Higher Education's Jawaharlal Nehru Medical College, Belagavi, Karnataka, India. All the pregnant women who delivered 'between' January, 2016 to December, 2016 in the labour wards were included in the study and classified according to Robson's Ten Group Classification System (RTGCS). **Results:** A total of 6236 women were delivered. Out of which 3454 (55.38%) women delivered vaginally and 2782 (44.61%) women delivered through cesarean section. In this study, Group 5 was the largest contributor to the cesarean section rate 18.6% whereas, group 1 was second highest (8.1%). Group 1 (31.9%) and 3 (21.4%) contributed to most of the obstetric populations. However, Group 6, 7, 8 and 9 contribution to overall cesarean section rate was 1.7, 1.2, 1.4 and 0.5%, respectively. Group 10 also contributing significantly to cesarean section rate (4.4%). **Conclusion:** The study revealed that Group 1, 2 and 5 contributed to high cesarean section rate. Thus, changing the norms for non-progress of labour and fetal distress, training and encouraging obstetricians to perform versions when not contraindicated could reduce the cesarean section rate. Trial of Labour after Cesarean (TOLAC) should be offered to women with previous CS after proper patient selection and counseling the pregnant women regarding its risks and benefits.

Key words: Pregnancy, cesarean section, Robson's ten group classification system, trial of labour after cesarean and obstetricians

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Cesarean section (CS), is an important surgical intervention to save life of mother and fetus. However, it is associated with increased risk of blood transfusion, hysterectomy and death as compared to vaginal delivery and also uterine rupture, placenta previa and placenta accreta in future pregnancies[1].

There is rise in CS rates in the past few decades, not only in developed countries but also in developing countries and in different hospitals, in the same country. The increase in CS rates is seen not only in high risk patients but also in low risk patient category, specifically the nulliparous, with term singleton fetus with vertex presentation without other complications[2].

The rise in CS rate is due to, rise in number of women with previous CS, increased use of electronic fetal monitoring which in turn identifies more cases as fetal distress, increasing incidence of elderly primigravida, increased labour induction, increased CS on maternal request, increased number of pregnancies following infertility treatment including multiple pregnancies[3].

Implementation of effective measures to lower the rate of cesarean sections demands a thorough study of each case to identify the most frequent patient group undergoing this procedure[3]. The lack of standardised internationally accepted classification to monitor and compare CS rates is a factor preventing the better understanding of this rise and its underlying causes[3,4].

In 2001, Michael Robson introduced Robsons Ten Group Classification System (RTGCS) to analyse the cesarean sections and to classify them to various groups. RTGCS identifies the group with high cesarean section (CS) percentage and is appropriate for long term tracking and international comparison of this increase in cesarean section trend[4-6]. The WHO statement (Geneva 2014) proposes the use of the Robson classification as the global standard for assessing, monitoring and comparing cesarean section rates within health care facilities[1,4,5]. Hence, this one year observational descriptive study was conducted to find out the frequency and indications of CS in a tertiary hospital and analyse them in depth, to know the significant contributors to rise cesarean section rates using RTGCS.

MATERIALS AND METHODS

The present study was conducted in the Department of Obstetrics and Gynecology, at teaching hospital attached to KLE Academy of Higher Education's Jawaharlal Nehru Medical College, Belagavi, Karnataka, India. The study was a descriptive hospital based observational conducted "between" January, 2016 to December, 2016. A total of 6236 women were delivered during the period were included and classified according to Robson's Ten Group Classification System (RTGCS) (Table 1). Ethical clearance for the present study was obtained from Institutional Ethics Committee on Human Subjects Research. Waiver of consent was taken from the institutional ethics committee as no identifiable information was revealed.

Inclusion criteria: All pregnant women with gestational age of more than or equal to 20 weeks and who were in labour.

Statistical analysis: Data was entered using Microsoft Excel version 2013 and analyzed using IBM SPSS version 20.0. (Armonk, NY, USA). Data was summarized in percentages and proportions. Diagrammatic representation of the data was represented by pie charts. Chi square test was used to determine any association between variables with significance level at 5% ($p<0.05$ considered to be statistically significant).

RESULTS

During the study period a total of 6236 women were delivered. The data obtained was coded and entered into the Microsoft Excel spreadsheet. The data was analysed according to Robson ten group classification system (Table 1) and the final results and observations were interpreted as follows. In this study, total number of deliveries for one year duration were 6236, among them, 55.38% were vaginal deliveries and 44.61% were cesarean sections (Table 2). Total number of

Table 1: Robsons ten group classification system

Groups	Robsons ten group classification
1	Nulliparous, single cephalic >37weeks in spontaneous labour
2	Nulliparous, single cephalic >37 weeks induced or CS before labour
3	Multiparous (excluding previous CS), single cephalic, >37 weeks in spontaneous labour
4	Multiparous (excluding previous CS), single cephalic, >37 weeks, induced or CS before labour
5	Previous CS, single cephalic, >37 weeks
6	All nulliparous breeches
7	All multiparous breeches (including previous CS)
8	All multiple pregnancies (including previous CS)
9	All abnormal lies (including previous CS)
10	All single cephalic, <36 weeks (including previous CS)

Table 2: Number of deliveries

Total No. of deliveries	6236 (100%)
No. of vaginal deliveries	3454 (55.38%)
No. of cesarean sections	2782 (44.61%)

Table 3: Number of vaginal and cesarean sections in preterm and term deliveries

Gestational age	Number of vaginal deliveries	Number of cesarean sections	Total No. of deliveries
<37 weeks	419 (55.13%)	341 (44.86%)	760 (12.15%)
>37 weeks	3035 (55.42%)	2441 (44.5%)	5476 (87.8%)

Table 4: Distribution of cesarean sections across Robson's ten groups

Robson's ten groups	Number of vaginal deliveries to total number of women in each group (%)	Cesarean section rate in each group (%)	Relative size of groups (%)	Contribution made by each group to the overall cesarean section rate (%)
1	1483/1991(74.5%)	025.50% 508/1991	31.90% 1991/6236	8.10% 508/6236
2	161/502 (32.1%)	67.92% 341/502	8.00% 502/6236	5.50% 341/6236
3	1205/1334 (90.3%)	9.70% 122/1334	21.40% 1334/6236	2.10% 129/6236
4	99/158 (62.7%)	37.30% 59/158	2.50% 158/6236	0.90% 59/6236
5	81/1239 (6.5%)	93.50% 1158/1239	19.90% 1239/6236	18.60% 1158/6236
6	13/122 (10.7%)	89.30% 109/122	1.91% 122/6236	1.70% 109/6236
7	15/95 (6.5%)	84.20% 80/95	1.50% 95/6236	1.28% 80/6236
8	39/129 (30.2%)	69.80% 90/129	2.20% 129/6236	1.40% 90/6236
9	0/31 (0.0%)	100.00% 31/31	0.50% 31/6236	0.50% 31/6236
10	358/635 (56.4%)	43.60% 277/635	10.20% 635/6236	4.40% 277/6236

Table 5: Indications of cesarean sections in Robson 1-4 Group

Indication	Group 1	Group 2	Group 3	Group 4
Fetal distress	242 (47.6%)	82 (24%)	59 (48.4%)	06 (10.2%)
Failed induction	0	112 (32.8%)	0	14 (23.7%)
Non progress of labour	60 (11.8%)	24 (7%)	15 (12.3%)	0
CPD	55 (10.8%)	10 (2.93%)	03 (2.45%)	02 (3.38%)
Placenta previa	05 (0.98%)	06 (1.75%)	06 (4.9%)	07 (11.9%)
Bad obstetric history (BOH)	0	03 (0.87%)	0	10 (16.9%)
Macrosomia	01 (0.19%)	20 (5.9%)	02 (1.63%)	04 (6.7%)
Severe pre eclampsia	22 (4.33%)	25 (5.9%)	03 (2.45%)	07 (10.2%)
Antepartum eclampsia	31 (6.2%)	0	02 (1.63%)	01 (1.69%)
Second stage arrest	30 (5.9%)	07 (2.05%)	08 (6.5%)	0
Deep transverse arrest	13 (2.55%)	06 (1.75%)	01 (0.8%)	0
Abruption placenta	12 (2.36%)	04 (1.17%)	10 (8.2%)	0
Anamnios/severe oligohydramnios	13 (2.55%)	14 (4.1%)	0	02 (3.38%)
Prolonged PROM	07 (1.37%)	0	02 (1.63%)	0
Persistent OP position	05 (0.98%)	0	01 (0.81%)	0
Face presentation	03 (0.59%)	0	05 (4%)	0
Cord presentation	01 (0.19%)	0	01 (0.8%)	0
Brow presentation	0	0	02 (1.63%)	0
Precious pregnancy	03 (0.59%)	13 (3.81%)	0	05 (8.47%)
Maternal diseases	04 (0.78%)	10 (2.93%)	0	01 (1.69%)
Obstructed labour	01 (0.19%)	0	02 (1.63%)	0
Doppler changes	0	05 (1.46%)	0	0
Total (N = 1030)	508 (49.3%)	341 (33.1%)	122 (11.8%)	59 (5.72%)
Contribution overall to CS rate (N = 2782)	18.2%	12.25%	4.38%	2.12%

preterm deliveries were 12.15% and term deliveries were 87.8%. In pre-term deliveries, 55.13% were vaginal and 44.86% were cesarean sections. In term deliveries, 55.42% were vaginal deliveries and 44.5% were cesarean sections (Table 3). Table 4 depicted distribution of women among different groups and cesarean section rates according to RTGCS. It can be appreciated that Group 5, which consists of multiparous patients, with at least one previous cesarean section and singleton pregnancies at term, was the largest contributor to overall cesarean section rate i.e., 18.6%, followed by Group 1 (8.1%) and 2 (5.5%). Group 1 and 2 were nulliparous, term, single, cephalic, vertex presentation (NTSV) in spontaneous labour and induced/cesarean section before labour, respectively whereas, group 3 and 4 consist of multiparous patients with similar characteristics, respectively (Table 1). Group 1 (31.9%) and 3 (21.4%) contributed to most of the obstetric population. Group 10 also contributing significantly to cesarean section rate (4.4%) Group 6-9 has highest cesarean section rate because of obstetric conditions in that particular groups (Table 4). In Table 5, it showed most common indications of cesarean sections in Group 1-4. In Group 1, it was fetal distress (47.6%) followed by NPL (11.8%) and CPD (10.8%), whereas, in Group 2,it was failed induction (32.8%) followed by fetal distress (24%) and NPL (7%), most common indication of CS in Group 3 was fetal distress (48.4%) followed by NPL (12.3%) and abruption placenta (8.2%)and in Group 4,

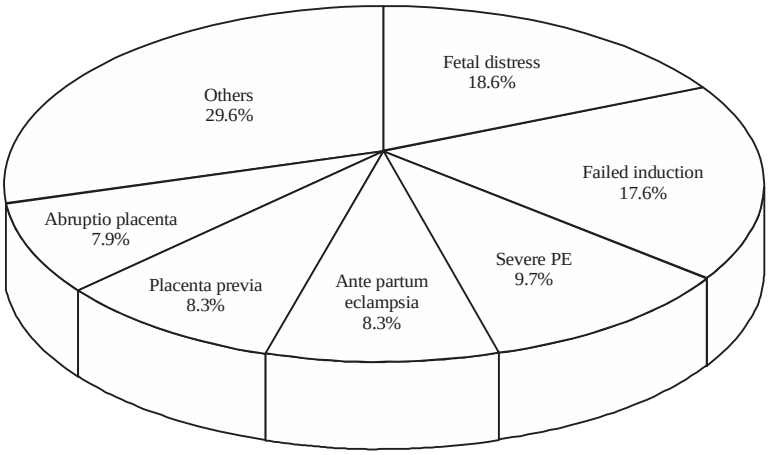

Fig. 1: Indications of primary cesarean section in Group 10

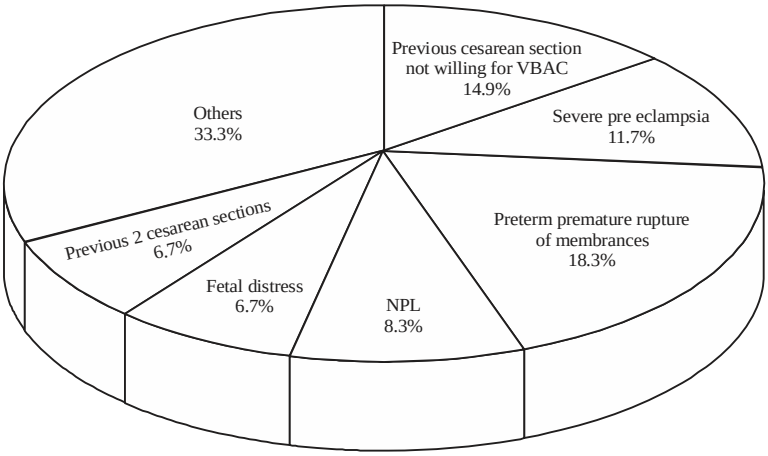

Fig. 2: Indications of repeat cesarean section in Group 10

Table 6: Subanalysis in Group 5

Distribution of cases in Group 5	Number	Percentage
Allowed for VBAC	139	11.2
Repeat cesarean sections	1100	88.8
Total cesarean sections in Group V	1239	100.0

Table 7: Outcome in women in VBAC group

VBAC	Number	Percentage
Successful VBAC	81	58.3
Failed VBAC	58	41.7
Total women allowed for VBAC	139	100.0

most common indication was failed induction (23.7%) followed by BOH (16.9%), placenta previa (11.9%), foetal distress (10.2%), severe pre-eclampsia (10.2%). In this study a total of 1239 women were in Group 5, out of which VBAC was allowed in 139 women (11.2%) and 1100 women (88.8%) underwent repeat cesarean section (Table 6). In group 5, a total of 139 women were allowed for VBAC, out of which 81 (58.3%) women had successful VBAC and 58 (41.7%) women had failed VBAC and had undergone repeat cesarean section (Table 7). The indications of repeat cesarean section in failed VBAC women were NPL (50%), fetal distress (32.8%) and suspected antenatal scar dehiscence (17.2%) (Table 8). The commonest indication for cesarean section in these patients, who were not willing for VBAC 572 (52%), patients not eligible for VBAC were 366 (33.2%) and Patients with previous 2 cesarean sections were 155 (14%) and with previous 3 cesarean sections were 7 (0.63%) (Table 9). In Group 10, total number of cesarean sections were 277. Out of which 61 (22%) were repeat cesarean sections and 216 (78%) were primary cesarean sections (Table 10), most common indication for primary caesarean section in group 10 was fetal distress (18.6%) followed by failed induction (17.6%) (Fig. 1). In Group 10, 61 women had undergone repeat cesarean section, most common indication was preterm premature rupture of membranes (18.3%), followed by previous cesarean section not willing for VBAC (14.9%) (Fig. 2).

Table 8: Indications of Cesarean sections in failed VBAC group

Indication for cesarean sections in failed VBAC	Number	Percentage
Non progress of labour	29	50.0
Fetal distress	19	32.8
Suspected antenatal scar dehiscence	10	17.2
Total	58	100.0

Table 9: Indications for repeat cesarean sections in Group 5

Indication for repeat cesarean sections	Total	p-value
Not willing for VBAC	572 (52.00%)	0.004*
Not eligible for VBAC	366 (33.20%)	0.0001*
Previous 2 cesarean sections	155 (14.00%)	0.09
Previous 3 cesarean sections	07 (0.63%)	0.08

*Indicates the significance of p<0.001

Table 10: Analysis of Cesarean sections in Group 10

Group X	Number	Percentage
Previous cesarean sections	61	22
Primary cesarean sections	216	78
Total LSCS in Group X	277	100

DISCUSSION

Cesarean section rate is an important indicator to access the essential obstetric care. Many classifications systems have been proposed previously for classifying cesarean sections. In 2001 Michael Robson introduced Robsons Ten Group Classification System for classifying cesarean sections. Two systematic reviews conducted at WHO identified this classification as the most appropriate system to fulfil current international and local needs[7]. The WHO Statement (Geneva 2014) proposes the use of the Robson classification as the global standard for assessing, monitoring and comparing cesarean section rates within healthcare facilities. Cesarean sections have long term implications on both mother and fetus. It is therefore important to determine the indications for cesarean sections at an institutional level which provides data regarding management of labour and delivery[2,4,5].

A total of 6236 pregnant women who delivered during this period, were recruited in the study. All the women with gestational age of >20 weeks of gestation who were in labour were classified according to RTGCS. Out of which 3454 (55.38%) women delivered vaginally and 2782 (44.61%) women delivered through cesarean section.

In the current study, cesarean section rate was 44.61%. Being the tertiary care centre the hospital receives more of referrals which explains the high cesarean section rate. WHO proposes that at a population level cesarean section rates higher than 10% are not associated with reductions in maternal and new-born mortality rates[4,5]. Higher rates of cesarean section reflect the hospital section rate and not the population section rate. This is the biggest referral center in the Belgaum District and receives several referrals from peripheral centres which all are not well equipped. When compared to other studies the cesarean section rates lower than study conducted by Ferreira *et al.*[8] in Brazil and by Samba and Mumuni[9] where cesarean section rate was 46.6 and 46.9%, respectively but it is higher when compared to other studies conducted by Prameela *et al.*[10]. with 25.80%, Kazmi *et al.*[11] was 20.3%. The main indications for cesarean section in this study were previous cesarean section, fetal distress, failed induction of labour and non-progress of labour.

Previous cesarean section was responsible for 41.7% of cesarean sections performed in the study. This is similar to studies conducted by Kazmi *et al.*[11]. in Oman (33.3%) and Prameela *et al.*[10] at Mysore in India (32.8%). In this study, a number of cases with fetal distress were 452 and is the second most common indication for cesarean section accounting for 16.24% of cesarean deliveries compared to 37.7% in a study conducted by Makhanya *et al.*[12] in South Africa[12]. This marked difference can be attributed due to the method of diagnosis of fetal distress. In the hospital electronic foetal monitoring (EFM) is used to diagnose fetal distress. Randomized controlled trials have demonstrated that electronic foetal monitoring results in higher cesarean delivery rates without improving neonatal outcomes[13].

According to the World Health Organization (WHO), the fetal heart rate should be monitored by intermittent auscultation during the first stage of labour i.e., for every 15 min and every 5 min in second stage of labour[4]. The EFM should be used in carefully selected patients e.g., patients undergoing induction of labour, Foetal Growth Restriction (FGR), Gestational diabetes mellitus (GDM). However, due to the risk profile of the patients managed at this centre, the majority of patients have electronic foetal monitoring during labour. Improving fetal monitoring during labour may potentially reduce the cesarean delivery rate.

In this study non-progress of labour was responsible for 4.63% of total cesarean section rate. Nulliparous women have greater risk for non-progress of labour (10% in this study). In this study 15% of multiparous women undergone cesarean section due to non-progress of labour. The diagnosis and standard management of labour in these patients require review in this low risk grroup[3]. Non progress of labour may also be targeted as an indication to reduce cesarean section rates. Skilled pelvic examination to exclude Cephalopelvic Disproportion (CPD), use of the partogram to monitor and manage the labour, judicious administration of oxytocin to augment labour, as well as the presence of a trained labour companion may reduce cesarean sections for non-progress of labour. Presence of a supportive companion during labour not only shortens labour duration but also reduces the likelihood

of emergency cesarean delivery[14]. Current policy of the hospital does not allow for the presence of a companion in labour and this may be one of the strategy in reducing cesarean section rates, as well as improving patient satisfaction. The current findings suggest that there is need to develop clinical protocols for common indications for cesareans section to ensure cesarean sections are conducted appropriately and to enhance patient care.

In this study the Robson Ten Group Classification System was used to highlight the particular subgroups of women who make the most significant contributions to the cesarean section rate within the study setting. The high cesarean section rate in the institution is attributed by the women with previous cesarean section, single, cephalic, $\geq$37 weeks i.e., group 5 with 18.6% and nulliparous, single, cephalic, $\geq$37 weeks in spontaneous labour i.e., group 1 with 8.1% and nulliparous single, cephalic $\geq$37 weeks, induced or cesarean section before labour i.e., group 2 with 5.5%. Group 10 is (single, cephalic, including previous CS with gestational age $\leq$36 weeks) also responsible for a significant amount cesarean sections performed in this population (4.4%). A study by Litorp *et al.*[15] conducted in Tanzania reported a cesarean section rate of 27% with groups 1, 3 and 5 contributing 12, 12 and 14%, respectively[15].

In this study nulliparous patients at term included majority of the obstetric population i.e., 40% (group 1 is 31.9% and group 2 is 8%) as compared to most of the studies. They contributed second and third largest contributors to the cesarean section rate. Group 1 contributed 8.1% and group 2 contributes 5.5% i.e., 13.6% to overall cesarean section rate (44.61%). Main indications of cesarean sections in these groups being fetal distress, non-progress of labour, failed induction. This is similar to studies conducted by Kazmi *et al.*[11] 5.5%, Samba and Mumuni[9] 6.6%, Shirsath and Risbud[16] 8.8%, Prameela *et al.*[10] 9.52%, Gao *et al.*[17] 12.4%, Makhanya *et al.*[12] 14.9%, Ferreira *et al.*[8] 15.6%[10,12-17]. Group 1 and 2 are the most important groups in any obstetric population because they have the most variation in terms of management and outcomes. Therefore, appropriate diagnosis and management of first and second stage of labour is key strategy in reducing cesarean sections in this group. As fetal distress and failed induction were major contributors for cesarean sections, training on interpretation of foetal cardiotocographic recordings and proper use and interpretation of partograms play an important role in reducing primary cesarean section rate[15]. The important thing is to individualize every labour and so long as monitoring is good and if both mother and fetus are well, do not set a time limit in a tertiary center. Research indicates that reduction in induction of labour in group 2 is associated with reduction in cesarean section rate[15,18-20].

In this study Group 3 has majority (21.4%) of obstetric population next to Group 1 as compared to other studies. In the current study Group 3 and Group 4 contributed to 3% to the cesarean section rate. Foetal distress, non-progress of labour and failed induction being the most common indications of cesarean sections in group 3 and group 4. Cesarean sections are being unnecessarily performed in these two groups because of over diagnosis of fetal distress.

In this study Group 5 is the largest contributor to the cesarean section rate 18.6% .This is similar to other studies all over the world. The contribution of Group 5 to overall cesarean section rate in study conducted, by Ray *et al.*[21] was 8.29-28.9%, by Prameela *et al.*[10] was 8.48-25.80%, by Samba and Mumuni[9] was 11.2-46.9%, by Shirsath and Risbud[16] was 15.86-29.90% by Makhanya *et al.*[12] was 17.2-42.4%[9-12,16,21]. As per protocol in our institute women with one previous LSCS are eligible for VBAC. These patients are offered a choice of delivery either VBAC or repeat cesarean section. If eligible for VBAC and after counseling regarding benefits and risks associated with it, women will be allowed for VBAC.

In the current study there were 1239 women in Group 5. 139 women were allowed for VBAC and 1100 women had undergone repeat cesarean section. Out of this 1100, 155 women were previous 2 cesarean sections and 7 women were with previous 3 cesarean sections. Out of 139 women who were allowed for VBAC 81 women (58.3%) had successful VBAC and 58 women (41.7%) had repeat cesarean section. Non-progress of labour (50%) and fetal distress (32.8%) were responsible for majority of cesarean sections in patients with one previous cesarean section. VBAC should be offered to women with one previous lower segment cesarean section[22].

Although the cesarean rates in the groups 6, 7, 8, 9 is high, the groups account for a small proportion of the obstetric population and therefore, their contribution to the cesarean section rate is low. In the current study, contribution of Group 6, 7, 8 and 9 to overall cesarean section rate was 1.7, 1.2, 1.4 and 0.5%, respectively. External cephalic version is an important clinical procedure to reduce the cesarean section rate in this population and is encouraged from 36 weeks gestation unless there are any contraindications[23].

In this study Group 10 was the 4th largest contributor to the cesarean section rate (4.4%). Similar results were seen in studies conducted by Ferreira *et al.*[8] in Brazil in which Group 10 contributed 7.7% to overall cesarean section rate[8]. In this study a total of 277 women underwent cesarean sections. In which 216 (78%) were primary cesarean sections and 61 (22%) were women with previous cesarean section. Fetal distress (40 cases) and failed induction (38 cases) were major contributors for primary cesarean sections in this group.

CONCLUSION

Defining an optimal cesarean section rate in the setting may not be realistic due to wide range in health status of patients. Decreasing the primary cesarean section rates is the key to reducing overall cesarean sections and the major contributors to primary cesarean sections were fetal distress, non-progress of labour, CPD, failed Induction. The important thing is to individualize every labour and so long as monitoring is good and is the condition of both mother and fetus is good, do not set a time limit for induction to delivery in a tertiary care center. The TOLAC should be offered to women with previous CS after proper patient selection and after counseling the pregnant women regarding its risks and benefits. Changing the norms for non-progress of labour and fetal distress, training and encouraging obstetricians to perform versions when not contraindicated could reduce the cesarean section rate. This would be helping in adopting measures to control cesarean sections rates.

SIGNIFICANCE STATEMENT

The overall cesarean section rate in this study is 44.61%. It was observed that group 5, 1, 2 contributed to high cesarean section rate, 18.6, 8.1 and 5.5%, respectively. Group 10 also contributed significantly to high cesarean section rate. These findings are similar to results obtained in different studies across India. The above findings suggest knowledge gap, for improvement in use of evidence based guidelines and clinical protocols, for monitoring, main drivers of trends in cesarean section like induction, fetal distress and non-progress of labour, to optimise outcomes. Also implementation of evidence based strategies to avoid medically unnecessary primary cesarean section and to encourage the safe and appropriate use of vaginal birth after cesarean section, is needed.

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