AN OBSERVATIONAL STUDY OF CESAREAN TRENDS AT A TEACHING HOSPITAL IN PUNJAB

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ABSTRACT

Objectives: The objective of the study was to study the indications and risk factors for caesarean section (CS) and to study the caesarean rates in various patient groups as per Robson’s classification.

Methods: This prospective observational study was conducted at Government Medical College Amritsar over a period of six months. All the patients admitted for delivery beyond 22 weeks were allotted to Robson groups on admission and the indications of all CS were recorded. The data collected were tabulated and analyzed statistically.

Results: There were 553 deliveries in the study period, of which there were 241 CS amounting to a caesarean rate of 43.6%. Nulliparity, previous caesarean delivery and malpresentation were significant risk factors for CS but induction of labor was not associated with increased probability of caesarean delivery. Previous caesarean delivery was the most common indication of CS followed by foetal distress. Among Robson groups, group 10 had the biggest group size and biggest contribution to cesarean rates followed by group 5.

Conclusion: Tertiary care government hospitals have a higher cesarean rates due to referral of high-risk pregnancies. Increasing the rates of trial of labour after caesarean is one of the interventions that may serve to decrease the caesarean rates in such institutions.

Keywords: Caesarean section, Robson’s classification, Trial of labor after caesarean, Vaginal birth after caesarean.

INTRODUCTION

The increasing caesarean rates across the globe have been a matter of serious concern as well as controversy. Caesarean Section (CS), when medically indicated, has played a major role in saving many maternal and neonatal lives that would have been lost in pre-caesarean era and cesarean rates are one of the measures to assess the maternal care services. The WHO statement on caesarean rates in 2015, however, emphasized that when the caesarean rates at population level cross 10% of all deliveries, there is no significant benefit in terms of reduction in maternal and perinatal mortality rates [1].

Caesarean rate in India according to NFHS-4 (2015-16) was 17.2% which was almost two times the cesarean rates as per NFHS-3(2005-6) [2]. The same survey showed the CS rate in the state of Punjab to be 24.6% with rates in private sector as high as 39.7% against 17.8% in public sector.

The WHO recommends the use of Robson classification of all patients admitted for delivery in order to assess and compare, the caesarean rates and trends [3]. This classification assigns the pregnant women admitted for delivery to one of the ten distinct groups based on parity, onset of labor, number of foetuses, lie and presentation of the foetus and gestational age [4]. While groups one to nine are distinct, well-defined groups, all representing different risk factors for a CS, group ten is a rather heterogeneous group in which all pregnancies with less than 37 weeks gestation and single foetus in cephalic position are included irrespective of the parity and history of previous caesarean section.

Methods

The study was conducted in one of the obstetric units of Government Medical College Amritsar from January 2021 to June 2021. It was an observational study that did not involve any intervention at the level of patient care.

All the patients admitted for delivery beyond 22 weeks were allotted to Robson groups on admission itself as per the criteria mentioned in WHO guidelines (Table 1) [3]. Exclusion criteria included those who delivered at less than 22 weeks gestation or with fetal birth weight <500 g and those who underwent laparotomy for rupture uterus. Allocation to group 10 (preterm birth at <37 weeks gestation with single foetus in cephalic presentation) was done on the basis of gestational age on the day of delivery.

The data collected was studied statistically with online MedCalc® calculator. All the calculations were done with 95% CI and p<0.05 was considered statistically significant.

We also studied the most common indications for induction of labour and CS from the indoor records of all patients.

In Robson classification, the prevalence of each group was calculated in the study population along with group caesarean rate and relative contribution was calculated in percentage by the following formula.

Relative contribution (%) = no. of CS in group/Total no. of CS in the hospital × 100

RESULTS

There were 553 deliveries in the period, of which there were 241 CS amounting to a caesarean rate of 43.6%. Overall, 63 (11.39%) women had planned CS before onset of labor pains and rest were all emergency surgeries. 71 (29.46%) CS were done at <37 weeks gestation.
Demographic profiles of women delivering during the study period and pregnancy outcomes have been portrayed in Fig. 1. 264 (47.74%) of the pregnant women were nulliparous while 289 (52.26%) were parous. Of these, 126 (22.78%) had history of CS in past. The overall caesarean rate amongst nulliparous women was 31.8% while it was 22.08% in parous women without previous CS. Caesarean rate was 96% amongst the women with history of CS. Amongst all pregnant women with single foetus in cephalic presentation, nulliparity (OR 1.97, p=0.0097) and history of previous CS (OR 51.91, p<0.0001) were significant risk factors for CS.

Amongst 215 deliveries were preterm while 338 were term deliveries. The caesarean rate amongst preterm deliveries was 43.26% as against 43.79% amongst term deliveries. Amongst all pregnant women with singleton cephalic foetus with no previous CS, preterm birth was not associated with increased chances of CS (OR 0.86, p=0.54).

Amongst 341 women without previous CS, with a single foetus in cephalic presentation, labour induction was done in 80 women and another 261 presented with spontaneous onset labour. Cesarean rate was 20% amongst those who underwent induction of labour against 25.29% amongst those who had a spontaneous onset labour. Cesarean rate was higher amongst 53 women who had a term induction, i.e., 26% as against 7% among 27 women who had induction at preterm gestation. The most common indication for labour induction was premature rupture of membranes (PROM) in 37 cases followed by hypertensive disorders of pregnancy in 24 cases. Induction of labor was not associated with statistically significant increased chances of CS, irrespective of the parity or gestational age (OR 0.74, p=0.17).

Two factors that were found to be positively associated with chances of CS in women without any previous caesarean were multiple pregnancy (OR 3.21, p=0.08) and breech presentation (OR 3.51, p=0.0002), of which the latter had a statistically significant association.

The indications of 241 cesarean deliveries performed are listed in Table 2. The most common indication was previous CS (46.47%) followed by fetal distress/hypoxia (21.58%), together accounting for about two thirds of all cesarean deliveries. Placenta previa was

Table 1: Robson classification reporting table

| Gp                      | Total no. of women | Group size (%) | No. of vaginal delivery | No. of CS | CS rate in each group (%) | Relative CS rate (%) | Absolute CS rate (%) |
|-------------------------|--------------------|----------------|-------------------------|-----------|--------------------------|----------------------|----------------------|
| 1                       | 119                | 21.52          | 88                      | 31        | 26.05                    | 12.86                | 5.6                  |
| 2A                      | 34                 | 6.15           | 21                      | 13        | 38.23                    | 5.39                 | 2.35                 |
| 2B                      | 7                  | 1.26           | 7                       | 100       | 2.9                      | 1.26                 |                      |
| 3                       | 67                 | 12.11          | 56                      | 11        | 16.42                    | 4.56                 | 1.99                 |
| 4A                      | 19                 | 3.43           | 18                      | 1         | 5.26                     | 0.41                 | 0.18                 |
| 4B                      | 1                  | 0.18           | 1                       | 100       | 0.41                     | 0.18                 |                      |
| 5.1                     | 47                 | 8.5            | 1                       | 46        | 97.87                    | 19.09                | 8.32                 |
| 5.2                     | 23                 | 4.16           | 23                      | 100       | 9.54                     | 4.16                 |                      |
| 6                       | 20                 | 3.62           | 10                      | 10        | 50                       | 4.15                 | 1.81                 |
| 7                       | 27                 | 4.88           | 8                       | 19        | 70.37                    | 7.88                 | 3.43                 |
| 8                       | 11                 | 1.99           | 6                       | 5         | 45.45                    | 2.07                 | 0.9                  |
| 9                       | 3                  | 0.54           | 0                       | 3         | 100                      | 1.24                 | 0.36                 |
| 10                      | 175                | 31.64          | 104                     | 71        | 40.57                    | 29.46                | 12.43                |
|                         | 553                | 100            | 312                     | 241       | 43.58                    | 100                  | 43.58                |
an indication in 9 women without previous CS and it was a comorbid condition in nine women with previous CS. Six of these nine women with previous CS had placenta accreta syndrome and underwent a caesarean hysterectomy.

According to Robson classification (Table 1), the biggest group was group 10 (31.64%), followed by group 1 (21.52%), group 5 (12.66%) and group 3 (12.11%) respectively.

The maximum contribution to overall caesarean rate was from group 10 (29.46%) and group 5 (28.63%).

Group 1 and 2 (that included nulliparous women at ≥ 37 weeks gestation with single foetus with cephalic presentation) constituted 28.9% of total deliveries while group 3 and 4 (that included multiparous women without a previous uterine scar at ≥ 37 weeks gestation with single foetus with cephalic presentation) constituted 15.73% of all deliveries. The combined caesarean rate among Group 1-4, was 64/247=25.91%. It was 22.58% (42/186) in women who had spontaneous onset of labour pains. 7/20(35%) caesarean deliveries in group 2 were done before onset of labor pains for indications such as fetal hypoxia, placenta previa and CPD.

The most common indications of CS in these four groups were foetal distress (FHR abnormalities or foetal hypoxia, 36/64, 56.25%) and labor abnormalities (14/64, 21.87%).

Group 5 (Parous women with single cephalic pregnancy ≥ 37 weeks gestation with at least one previous uterine scar) contributed 12.66% but when considering all cases with previous CS, including group 7, 8, and 10, the total number of these women was 126(22.78%). While group 5 contributed to 28.63% of all CS, the overall contribution of previous CS as the indication for caesarean was 46.47%.

Amongst all 126 patients with previous CS, 34(26.98%) patients had previous 2 or more CS, 35 (27.77%) had comorbid conditions such as anaemia/hypertension/diabetes nine patients had placenta previa (7.14%), 8 (6.35%) had breech presentation, 6 (4.76%) had PROM with unfavourable Bishop score, 6 (4.76%) had previous caesarean within past 2 years, 5(3.97%) had placenta-foetal insufficiency, 3 (2.38%) had borderline or inadequate pelvis and 2(1.9%) had multiple gestation. The option for trial of labor after CS (TOLAC) was given to 18(14.28%) women, was refused by 12(9.5%) and vaginal birth after caesarean (VBAC) was successful in 5(3.97%) of the 6 women who chose TOLAC.

Overall abnormal lie and mal-presentations accounted for 9.58% of all deliveries and cesarean rate amongst these patients was 66%. Cesarean rates in group 6 (nulliparous single breech) and 7 (multiparous single breech) in our study were 50% and 70%, respectively. Among the ten assisted vaginal breech deliveries in group 6, 50% were already diagnosed with intrauterine fetal demise, 20% had fetal anomaly and remaining 30% were in advanced labor on admission.

Group 9 that included all pregnancies with transverse lie, had the smallest size but 100 percent caesarean rate.

There were 11 cases of multiple gestation and cesarean rate was 45.45%. Among these 11 cases, three caesarean were done due to malpresentation of the first twin and two were done due to history of previous CS. Six women had a vaginal delivery in this group.

Group 10 was the largest group in numbers (31.64%) as well as in terms of its contribution to overall caesarean rate (29.46%). The most

### Table 2: Distribution of all caesarean deliveries based on primary indication of caesarean

| Indication of CS                                      | No. of women (N) | Percentage of total CS |
|------------------------------------------------------|------------------|------------------------|
| Previous CS                                          | 112              | 46.5                   |
| Fetal distress (on CTG) or Fetal hypoxia (on radiological investigations) | 52               | 21.6                   |
| Abnormal lie/malpresentation                          | 35               | 14.5                   |
| Abnormal labour (first stage/second stage abnormalities/obstructed labour) | 16               | 6.6                    |
| Placenta previa                                      | 9                | 3.7                    |
| Abruption placenta                                   | 3                | 1.2                    |
| CPD                                                   | 6                | 2.5                    |
| Failed induction                                     | 3                | 1.2                    |
| Maternal distress                                    | 3                | 1.2                    |
| Others                                                | 2                | 0.8                    |
| Total                                                 | 241              |                        |
common indication of caesarean in this group was a history of previous CS (41/71, 57.7%) followed by foetal distress (16/71, 22.5%). 27 women in this group underwent induction of labor and the caesarean rate amongst them was 7.4%. The most common indication of induction was preterm PROM (19) followed by hypertensive disorders [5,6].

**DISCUSSION**

Globally past few decades have seen rapid increase in caesarean rates. While the facilities for CS remain one of the critical intervention in emergency obstetric care, equally critical is the fact that CS should always be done only for medical indications and not otherwise [1].

The cesarean rate in the present study of 43.6% is similar to the results of Konar [43.13%] and Jamwal [46.12%] but lesser than the results of Shenoy [57.88%] and Kant [53.86%] [5-8]. At the same time, our cesarean rates are much higher than Mittal [23.7%], Prameela [29.33%], Dar [36.11%], and Dhotapkar [32.6%] [9-12].

Amongst the indication of CS, our results of most common indication previous CS [46.47%] followed by foetal distress/hypoxia [21.58%] were quite similar to that of Dar [previous LSCS 44.74%, foetal distress 16.82%] but the proportion of caesarean due to failed induction was only 1.24% in our study against 9.37% in the study by Dar [11].

Group 5 (Term gestation with cephalic presentation with a history of previous CS) was the third biggest group in our study in terms of group size (12.66%) and second biggest (28.63%) in its contribution to caesarean rate, similar to the results by Mittal [29.4%] [9].

In fact, total women with previous CS in our study were 22.78% and it was 11.14% in study by Mittal but the major difference was that a successful VBAC was done in only 3.9% of these women in our study while it was done in 17.6% in the latter study [9]. Previous CS was an indication in 46.47% of total caesarean in our study. Group 5 had a group size of 9-20% in other studies which had a group cesarean rate between 90-100% and it contributed to 27 - 40% of total caesareans in them [6-13]. The Group-specific CS Rates amongst various Indian studies have been compared in Table 3.

This analysis once again emphasizes the dominos effect that increasing caesarean rates have towards further increasing cesarean incidence as was described by Vogel [14]. This will be more evident if women with previous CS that are included in group 10 due to preterm birth, are also included in group 5.

The only way to counter this dominos effect is by decreasing primary caesarean rates and encouraging TOLACs. Robson guidelines recommend caesarean rates in this group to be 50-60% [2]. The major barriers experienced by us in offering TOLAC were more than 1 previous caesarean deliveries (27%), comorbid conditions (28%) like anemia, hypertension, diabetes, refusal for TOLAC by the pregnant woman (10%), placenta previa (7%) and small inter-pregnancy intervals (6%) which were similar to findings by Dhotapkar [12]. Mittal reported previous multiple uterine scars (15.6%), fetal distress (30%), signs of impending rupture (28%), failed induction (13%) and CPD (19%)as main impediments to VBAC in addition to woman's refusal for TOLAC (10%) [9]. Dar reported fetal distress (26%), scar tenderness (19%) and CPD (12%) as main indications for repeat cesarean [11].

Group 1 and 2 contributed 28.93% of all deliveries and 21.45% of total cesarean deliveries in our study. Other studies reported the contribution of group 1+2 to total deliveries from 44-50% and the contribution to cesarean rates was between 33% and 46% [5-12] (Table 3). Prameela, on the other hand, reported 48% of women in these groups with only 11.8% contribution to caesarean rate [10]. According to Robson guidelines, these two groups usually represent 35-42% of obstetric population and caesarean rates of 10% in group 1 are achievable and in group 2 should be around 20–35% [2].

Our results of cesarean rates in group 1 of 26% and in group 2 of about 48% are definitely higher than these guidelines but can be explained by the fact that most of our patients were high-risk pregnancies referred due to complications such as hypertension, and IUGR. Fetal distress was the most common indication of CS in these two groups (58.8%). Our caesarean rate of group 1 was similar to Dhotapkar (23.5%) [12], higher than 6-18% in studies by Prameela [10], Dar [11] and Kant [8] but lesser than 32-48% in other studies [5-7]. Our CS rates of group 2 were similar to Shenoy [52.5%] [7], Dar [11] (48.8%) and Prameela [11] (49%) but lesser than 60-70% rates found by other studies [5-8] (Table 3).

We did not find induction of labor to be associated with increased probability of CS (OR 0.74, p=0.16) regardless of gestational age and parity.

Group 3 and 4 formed 15.71% of the study and its contribution to caesarean rate was just 4.56% for group 3 and even lesser 0.36% for group 4 which are much lesser than the cut off of 3% and 1.5% given in Robson guidelines for group 3 and 4 respectively [2]. The smaller size of group 3+4 can be a reflection of relatively bigger size of group 5 in a tertiary care center. Other studies reported the group size of 3+4 to be more than 20% of all deliveries but contribution to cesarean rates were <10% [9-12]. Konar on the other hand reported 26.3% of all deliveries and 15.6% of all caesarean deliveries to be from group 3+4 [5] (Table 3).

Group 10 was the largest group in our study both in terms of group size as well as the relative contribution to caesarean rates (29.6%). This group represents all the singleton deliveries with cephalic presentation at a gestation less than 37 weeks. In our study more than two-third of women in group 10 (68.57%) were between 34 and 37 weeks gestation. The caesarean rates of this group in our study was 40.57% which was higher than the 30% rates as per Robson guidelines [2]. Studies showed a wide variation regarding caesarean rate (23-91%) in group 10 whereas Prameela [10] reported caesarean rates as low as 11.13% (Table 3). This wide variation is also the result of a heterogeneous composition of group 10.

We didn't find preterm birth to be a risk factor for CS and the higher caesarean rate and the highest relative contribution to caesearan

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**Table 3: Comparison of group specific CS rates amongst various studies**

| Study     | Biggest group by size | Groups making biggest contribution to caesarean rate | Group specific CS rates |
|-----------|-----------------------|-----------------------------------------------------|-------------------------|
| Present study | 10 | 10.5 | 26 49 16.5 10 98.5 50 70.5 45.5 100 40.5 |
| Konar [5]  | 1  | 1.5  | 42 60.5 24.5 34 95.5 65.5 56.5 60 100 27.5 |
| Jamwal [6] | 1  | 5.2  | 32 61.5 4 8.5 99 100 91.5 75 100 48 |
| Shenoy [7] | 2  | 5.2  | 48 52.5 1 20.5 100 93.5 100 89 100 91 |
| Kant [8]   | 2  | 2.5  | 18.5 69.5 6 22.5 94.5 100 100 100 51 |
| Prameela [10] | 1  | 5.2  | 6 49.5 4 23.5 97 98 52.5 53 100 11 |
| Dar [11]   | 1  | 5.2  | 16 49 6 26 97 86 73 29 100 39 |
| Dhotapkar [12] | 1  | 5.1  | 23.5 33.5 6 12 90 100 100 76.5 100 33 |

**Note:** The data is presented in a tabular format, showing the comparison of group-specific caesarean section (CS) rates amongst various studies. The table includes study details, group size, and the relative contribution to caesarean rates.
rate was mainly because of the women with previous caesarean who contributed to 57.7% of caesareans in this group. Amongst the women in group 10 with no previous CS, the most common indication of CS was fetal distress. The rate of induction of labour in this group was 20.77% that was similar to induction rate of 21.46% amongst women with single foetus in cephalic presentation at term gestation but cesarean rate was just 7.4% amongst the preterm induction group against 26.4% when induction was done at term gestation.

The small size of group 6, 7 and 9 (3.6%, 4.9%, 0.5%) and their relatively low (5.6%) contribution to caesarean deliveries was similar to results of most of the studies [5-13]. Our caesarean rates of 50% in group 6 (multivariable single breech) and of 70% in group 7 (multivariable single breech) were very low compared to other studies. Most of other studies showed a CS rates of 95–100% in these 2 groups [6-9] except Konar [5], Jogia [13] and Dar [11] who reported 65–85% cesarean rates in group 6 and Prameela [10], Konar [5] and Dar [11] who reported 52–73% caesarean rates in group 7 (Table 3). Vogel mentions that CS rates of less than 100% in these groups is an unmet need of CS [14]. In our study, most of the assisted vaginal breech deliveries in group 6 were conducted in women already diagnosed with intrauterine fetal demise, fetal anomaly and those reporting in advanced labour on admission.

Group 9 was a very small group with 100% caesarean rates and the results were similar in all studies [5-13].

Group 8 representing multiple gestation was another small group with 45% caesarean rate which was similar to Prameela (52%) but lesser than the caesarean rates of 60–100% found in other studies [5-8,10,13]. According to Robson guidelines, caesarean rates in this group can be around 60% [2].

CONCLUSION
Previous caesarean is the major risk factor contributing to increasing caesarean rates. Other significant risk factors are nulliparity and malpresentations. Induction of labour, when medically indicated and preterm birth are not associated with increased risk of CS.

Tertiary care government teaching hospitals have a high caesarean rates due to high in-referral of high risk pregnancies. Increasing the rates of TOLAC is one of the interventions that may serve to decrease the caesarean rates in such institutions. Group 1 and 2 is another area of focus in efforts to decrease primary CS.

Strength and weakness of study
The strength of our study is that we studied not only the trends in CS as per Robson classification but also the indications of CS in different groups. We tested various risk factors for their statistical association with CS. The weakness of our study was a relatively short study period and the fact that we didn’t compare the important aspect of effect of mode of delivery on neonatal outcomes in various groups.

AUTHOR’S CONTRIBUTION
The main concept and study design was prepared by Suparna Grover. Data collection was done by Sunita Meena, while data analysis and preparation of the manuscript was done by Ajay Chhabra.

CONFLICTS OF INTEREST
Nil.

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