

## Analysis of caesarean section using the Robson's ten group classification system - a way of monitoring obstetric practice

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Manuscript submitted – 6<sup>th</sup> April 2021

Peer review completed – 20<sup>th</sup> May 2021

Accepted for Epub – 21<sup>st</sup> July 2021

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### Abstract:

**Aim:** The aim of present study was to calculate overall cesarean section rate, to identify groups of women (distributed according to Robson's Ten Group classification system) contributed most to overall cesarean section rate and to analyze cesarean section rates within groups in our institute. **Methods:** A cross sectional study was conducted for a period of 1 year from January 2019 to December 2019. All pregnant women with gestational age more than 28 weeks, delivered during the study period were classified according to Robson's ten group classification system. Cesarean section rate, group size, group cesarean section rate and absolute and relative contribution of each group to caesarian section (CS) rate were calculated and analysis was done. **Results:** The overall cesarean section rate was 42.39%. Group 3 included multiparous women (excluding previous cesarean section), with single pregnancy cephalic, at term in spontaneous labour, was the largest group (group size 29.87%). The second largest group was group 1 included nulliparous women with single pregnancy cephalic at term (group size 23.49%), with a CS rate of 34.51%. Group 5, which consists of multiparous women, with at least one previous section and single pregnancy in cephalic presentation at term, was the largest contributor to overall caesarean section rate (38.69%). **Conclusion:** Women with previous cesarean section constitute the most important determinant of overall caesarean section rates. Decreasing the primary caesarean section rates is the key to reducing overall caesarean section rates.

**Keywords:** Cesarean section, Robson classification.

The crude rate of cesarean section is an important indicator for measuring access to obstetric services. Rising caesarean section rates have been observed worldwide in recent decades, but determinants of this increase are controversial. Cesarean delivery has higher maternal risks for the current and subsequent pregnancies compared with spontaneous vaginal birth<sup>1</sup>. The frequencies of some maternal complications which include anaesthetic complications<sup>2</sup>, hemorrhage, infection, injury to adjacent organs and thromboembolism are increased with caesarean sections as compared with vaginal deliveries<sup>3</sup>. For women undergoing subsequent caesarean, these maternal risks are even greater. The incidence of placenta previa increases. There is an increased risk of placenta accrete and hysterectomy<sup>4</sup>. For the neonate, it offers lower rates of birth trauma and still birth but greater rates of initial respiratory difficulties<sup>1</sup>.

Many classification systems have been proposed by different authors for classifying caesarean sections. In 2001 Michael Robson introduced "Robson's ten group classification system" for classifying caesarean sections. The WHO statement (Geneva 2014) proposes the use of "Robson's ten group classification system" as the global standard for assessing, monitoring and comparing caesarean section rates within health care facilities<sup>5</sup>.

The Robson classification is for “all women” who deliver at a specific setting and not only for the women who deliver by cesarean section. It is a complete perinatal classification. It provides a framework for monitoring and auditing CS rates. It is based on four obstetric concepts: category of pregnancy, previous obstetric history, course of pregnancy and gestational age. On this basis women are categorized into ten groups. The classification process is mutually exclusive and all inclusive, which means that every woman fits into one group and one group only<sup>6</sup>. Main strengths of the Robson classification are the simplicity of its design, the validity of its purpose, its ease of implementation and directness of initial interpretation<sup>7</sup>.

The aim of present study was to calculate overall cesarean section rate, to identify groups of women (distributed according to Robson’s ten group classification system) contributed most to overall cesarean section rate and to analyze cesarean section rates within groups in our institute.

### Material and methods

The present study was a cross sectional descriptive study conducted in the department of obstetrics and gynaecology, Kamla Raja Hospital and Gajra Raja Medical College, Gwalior (MP), for a period of 1 year from January 2019 to December 2019. It included all pregnant women with gestational age more than 28 weeks, delivered during the study period. Data was collected from hospital records. Details of study participants like parity, gestational age at delivery, onset of labor (spontaneous or induced), presentation of fetus (cephalic, breech or any other), singleton or multiple pregnancy, previous delivery details like mode of delivery, were collected.

All women were classified according to “Robson’s ten group classification system” as follows<sup>8</sup> -

1. Nulliparous women with a single cephalic pregnancy,  $\geq 37$  weeks gestation in spontaneous labour.
2. Nulliparous women with a single cephalic pregnancy,  $\geq 37$  weeks gestation who either had labor induced or were delivered by cesarean section before labour.
3. Multiparous women without a previous uterine scar, with a single cephalic pregnancy,  $\geq 37$  weeks gestation in spontaneous labour.
4. Multiparous women without a previous uterine scar, with a single cephalic pregnancy,  $\geq 37$  weeks gestation who either had labor induced or were delivered by cesarean section before labour.
5. All multiparous women with at least one previous uterine scar, with a single cephalic pregnancy,  $\geq 37$  weeks gestation.
6. All nulliparous women with a single breech pregnancy.
7. All multiparous women with a single breech pregnancy, including women with previous uterine scars.
8. All women with multiple pregnancies, including women with previous uterine scars.
9. All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars.
10. All women with a single cephalic pregnancy,  $< 37$  weeks gestation including women with previous uterine scars.

Following definitions were used for core variables -

**Nullipara:** a women who had not delivered an infant weighing  $\geq 1$ kg or at gestational age  $\geq 28$  weeks, alive or dead, with or without congenital malformations, by any route.

**Multipara:** a women who had at least once delivered an infant weighing  $\geq 1$ kg or at gestational age  $\geq 28$  weeks, alive or dead, with or without congenital malformations, by any route.

**Spontaneous labor:** prior to delivery women was in spontaneous labor.

**Induced labor:** upon admission to the labor ward, the woman was not in labor and was then induced.

**Pre-labor CS:** Woman not in labor when admitted for delivery and a decision was taken to deliver by CS.

**Term:** delivery at gestational age  $\geq 37$  weeks

Preterm: delivery at gestational age < 37 weeks

Statistical analysis was done with excel computer software. Data was recorded in “Robson classification report table” (table 1). The cesarean section rate was expressed as a percentage, calculated by dividing the number of births by caesarean section by the total no of deliveries during the study period. Firstly column one, two and three of “Robson classification report table” were filled, then percent calculation was performed. Group size (column four) was expressed as percentage, calculated by dividing the number of women in the group by total number of deliveries during the study period. Group cesarean section rate (column five) was expressed as percentage, calculated by dividing the number of CS in the group by the total no of deliveries in the group. Relative contribution of each group (column six) was expressed as percentage, calculated by dividing total number of caesarean sections in each group by total number of cesarean sections in the year. Absolute contribution of each group (column seven) was expressed as percentage, calculated by dividing total number of caesarean sections in each group by total number of deliveries in the year.

## Results

During the study period of one year (January 2019 to December 2019), total number of women delivered were 9977, out of which 4230 women were delivered by cesarean section. The overall cesarean section rate was 42.13%.

Group number	No of CS	No of women	Group size (%)	Group CS rate (%)	Absolute group contribution to overall CS rate (%)	Relative group contribution to overall CS rate (%)
1	809	2344	23.49	34.51	8.10	19.12
2	725	1078	10.8	67.25	7.26	17.13
3	230	2981	29.87	7.71	2.30	5.43
4	121	308	3.08	39.28	1.21	2.86
5	1637	1863	18.67	87.86	16.40	38.69
6	410	510	5.1	80.39	4.10	9.69
7	67	97	0.97	69.07	0.67	1.5
8	53	129	1.29	41.08	0.53	1.25
9	56	59	0.59	94.91	0.54	1.27
10	122	608	6.09	20.06	1.24	2.93
Total	4230	9977	100			100

Robson classification report table shows that most of the obstetric population was represented by nulliparous women with single pregnancy in cephalic presentation,  $\geq 37$  weeks gestation i.e. group 1 and 2 (34.29%). Multiparous women with single pregnancy in cephalic presentation,  $\geq 37$  weeks gestation i.e. group 3 and 4 represented 32.95% of obstetric population.

Group 3 had maximum number of subjects (n=2981, group size 29.87%), out of which 7.7% had cesarean section. The second largest group of subjects was group 1(n=2344, group size 23.49%), of which 34.51% underwent cesarean section. Nullipara and multipara women with breech presentation including previous CS i.e. group 6 and 7 respectively represented 6.07% of obstetric population. Group 9 which included all women with abnormal lie including previous CS was the smallest group with group size 0.59%. Women with single pregnancy in cephalic presentation at <37 weeks i.e. group 10 represented 6.09% of obstetric population.

The group cesarean section rate for group 2 and 4 (nullipara and multipara without previous CS respectively, with a term single fetus in cephalic presentation with induced delivery or cesarean section before labor) was 67.25% and 39.28% respectively.

The rate of cesarean section for group 5 was 87.86%, although the group size was 18.67%. The cesarean section rate for nulliparous breech (group 6) was 80.39 % while it was 69.07% for multiparous breech (group 7). Group 9 was the smallest group with maximum CS rate of 94.91%. CS rate for group 10 was 20.06%.

It can be appreciated from the table group 5, which consists of multiparous women, with at least one previous section and single pregnancy in cephalic presentation at term, was the largest contributor to overall caesarean section rate followed by group 1 and 2 with relative contribution of 38.69%, 19.12% and 17.13 respectively. Group 6 (nulliparous breech) was the fourth largest contributor to CS rate (relative contribution of 9.69%). Group 3 which was the largest group contributed 5.43% to CS rate. Relative contribution of group 7, 8, 9 and 10 was 1.5%, 1.25%, 1.27% and 2.93% respectively.

## Discussion

In present study the caesarean section rate was 42.13 %, higher than reported by RC Pameela et al (29.33%) and by Sidara Gilani et al (33.3%) in their studies conducted in a tertiary hospital Mysuru, Karnataka, India and in Pakistan respectively<sup>9,10</sup>. Joshua P Vogel et al reported caesarean section rates ranged from 9.8 % in Niger to 47.6% in China in WHO Multicentric survey (2010-2011)<sup>11</sup>.

Kamla Raja Hospital is a tertiary teaching hospital supported by 24 hours operation theatre, anesthesia and pediatric services and well equipped intensive care unit. It receives many unbooked patients and several referrals from private hospitals and peripheral health centers, which explains the high caesarean section rate found in our study. Reasons of referral are presence of some high risk factors, unavailability of ICU facility or facility for cesarean section, or of blood bank and unavailability of staff (obstetrician, anesthetist) in night, or relatives do not want to take risk there.

In present study, on assessment of type of obstetric population we found that most of the obstetric population was represented by nulliparous women with single fetus in cephalic presentation at  $\geq 37$  weeks of gestation i.e. group 1 and 2 (34.29%). Similar finding was reported by Arpita Y Reddy et al<sup>12</sup>.

The group 1 which included nulliparous women with single pregnancy cephalic at term in spontaneous labor is the second largest group with group size of 23.49%, while group 2 which included nulliparous women  $\geq 37$  weeks gestation with singlet fetus in cephalic presentation who either had labor induced or were delivered by cesarean section before labour represented 10.8% of the population. This suggests that majority of nulliparous women were in spontaneous labor at the time of admission. Out of 2,344 women in this group 1,809 women were delivered by cesarean section (group CS rate - 34.51%). This group was the second largest contributor of the overall CS rate (relative contribution of 19.12%). Robson stated a CS rate below 10% in this group<sup>8</sup>. The CS rate reported by Tahira Kazmi et al and RC Pameela et al in group 1 was 13% and 6.13% respectively, lower than reported in our study<sup>9,13</sup>.

The high CS rate in group 1 recorded in present study suggests that our hospital is serving a high risk population of nulliparous women, who need delivery by emergency cesarean section to avoid serious maternal and fetal complications. Also in urban population the average maternal age is rising due to late marriages, and older women especially nulliparas, have a higher risk of caesarean delivery. Also the frequency of operative vaginal delivery has declined. In depth analysis of indications of cesarean section among referred and directly admitted nulliparous women is needed so that interventions can be proposed and implemented in this specific group to reduce the caesarean section rate. The performance of cesarean section for non absolute indications like labor dystocia, cephalopelvic disproportion also needs to be investigated in this group. Criteria for diagnosis of labor, diagnosis and treatment of arrest of labor and labor dystocia should be well defined and need to be strictly followed by all units. Pelvis assessment needs to be done by a senior person on duty to avoid cesarean section for cephalopelvic disproportion. Residents should be encouraged to use partogram to monitor and manage labor, although it is not always possible to maintain partogram for every parturient in a busy labor room. Use of oxytocin for augmentation of labor in women with inadequate uterine contractions can avoid many cesarean sections for non progress of labor. Improving fetal heart monitoring in labor and training on interpretation of fetal cardiotocographic recordings play an important role in reducing caesarean section for fetal distress<sup>1</sup>.

Multiparous women with single pregnancy in cephalic presentation at term i.e. group 3 and 4 represented 32.95% of obstetric population. Group 3 i.e. multiparous women with a single foetus in cephalic presentation, who enter labor

spontaneously at term, was the largest group (group size 29.87%) among all delivering women with a low CS rate of 7.7%. CS rate reported by Arpita Y Reddy et al in group 3 was 9.7%, higher than reported in our study and by Tahira Kazmi et al and RC Prameela et al was 2.6% and 3.92% respectively, lower than reported in our study<sup>9,12,13</sup>. Since these multiparous women in group 3 represent a low risk obstetric population, so more likely to have a vaginal delivery. Caesarean in this group is mainly done for indications like fetal distress, obstructed labor and placenta previa. Hence, the CS rate in this group can be expected to be low.

The group cesarean section rate for group 2 and 4 (nullipara and multipara without previous CS respectively, with a term singleton fetus in cephalic presentation with induced delivery or cesarean section before labor) was 67.25% and 39.28% respectively. The high CS rates in these groups indicate that nulliparous and multiparous women who did not enter labor spontaneously at term might have admitted with some high risk, so that many times induction of labor cannot be attempted like in women with prolonged premature rupture of membranes, preeclampsia with severe hypertension or impending eclampsia, antepartum eclampsia with altered sensorium with many episodes of convulsions, emergency cesarean section is the only option left with obstetricians. Even if labor is induced after careful selection of cases, it carries a greater risk for cesarean delivery, this risk is particularly higher among nulliparous<sup>14,15</sup>. Further research is required to analyze indications of induction of labor, methods used for induction of labor and criteria to define failed induction in the women in whom labor induction is planned. Induction of labor on maternal request should be discouraged. Careful selection of cases by identifying factors associated with the success of induction of labor and allowing sufficient time for induction to progress are the steps to be taken to reduce caesarean section rate in this group. Practice of induction of labor in cases with no valid indication, especially those with an unfavourable cervix should be discouraged to alter caesarean section rate in this group. Prelabor cesarean sections also contributed to overall caesarean section rates. Women with history of infertility or conceived following assisted reproduction techniques or with history of recurrent pregnancy loss or with history of previous perinatal losses are usually delivered by elective cesarean section as both obstetrician and family of the patient do not want to take risk. Cesarean section on maternal request should be discouraged by explaining risk of maternal mortality, morbidity and serious consequences in subsequent pregnancy.

The rate of cesarean section was 87.86% for group 5 which consists of multiparous women, with at least one previous section and single pregnancy in cephalic presentation at term, although it represents 18.67% of the obstetric population. The CS rate reported in present study in group 5 is higher than reported by Tahira Kazmi et al (58.2%) and lower than reported by R C Prameela et al (96.9%), Gomathy E et al (93.2%) and Arpita Y Reddy et al (93.5%)<sup>9,12,13,16</sup>. A high CS rate in group 5 reported in this study is attributed to unbooked and referred mothers, who admitted with a history of trial of labor and who had no documentation of their previous cesarean, which made decision for further trial of labor difficult and, so usually end up with emergency caesarean section after a short trial, in order to safeguard the life of mother and fetus. In our institute, in women with previous delivery by cesarean section induction of labor using prostaglandins is totally avoided and oxytocin for augmentation of labor is occasionally given in small doses and under careful observation. It may be that more liberal application of induction and augmentation of labor when indicated may have increased the rate of successful VBAC in our hospital. Also more multiparous women with two or more than two previous cesarean sections are getting admitted in our labor ward. Although we do not have information about their actual number as we did not subdivide group 5, these women might have been contributed to high caesarean rate seen in this group, as it is our practice to deliver women with more than one previous cesarean by cesarean section only.

Robson's group 6 and group 7 represent high group specific caesarean section rates although the relative size of these groups was small. The caesarean section rate for nulliparous breech pregnancies (group 6) was 80.39% while it was 69.07% for multiparous breech pregnancies (group 7), lower than reported by Tahira Kazmi et al (90.9% in group 6 and 90.2% in group 7) and Arpita Y Reddy et al (89.3% in group 6 and 84.2% in group 7)<sup>12,13</sup>. Many times women with breech presentation reported hospital in active phase of labor with presenting part deep in the pelvis, due to delay in referral or delay in reaching hospital from remote areas and got delivered by vaginal route by assisted breech delivery. As Robson's classification does not include perinatal outcome, further research is needed to compare perinatal outcome of women with breech presentation delivered vaginally and by caesarean section.

Injury to fetus may still occur during caesarean section of women with breech presentation<sup>17</sup>. Mothers who prefer vaginal delivery and those admitted in advanced labor should be offered assisted vaginal breech delivery<sup>17</sup>. Currently American College of Obstetricians and Gynaecologists recommends that "the decision regarding the mode of delivery should depend on the experience of the health care provider" and that "planned vaginal delivery of a

term singleton breech fetus may be reasonable under hospital specific protocol guidelines”<sup>1</sup>. Cesareans done for breech presentation can be reduced by training residents in the art of breech delivery and external cephalic versions in the antenatal period. For breech presentations near term, the ACOG recommends that version be offered and attempted whenever possible<sup>1</sup>. Its success rate averages about 60%<sup>18</sup>.

Group 9 was the smallest group (group size-0.5%) with maximum CS rate of 94.91%. It included all women with abnormal lies (including previous CS). Out of 59 women with transverse lie, 56 women were delivered by cesarean section and 3 women were delivered vaginally following internal podalic version as they presented with intrauterine fetal demise in full dilatation of cervix.

Group 10 which included all women with a singleton pregnancy in cephalic presentation, < 37 weeks gestation including women with previous uterine scars represented 6.09% of obstetric population and CS rate for group 10 was 20.06%. According to Robson, size of group 10 should be less than 5% and CS rate in most population is usually around 30%<sup>8</sup>. Tahira Kazmi et al reported a smaller group size (1.8%) and higher CS rate of 80.8 % in group 10<sup>13</sup>. A larger group size reported in our study suggests that we are dealing with an obstetric population with high risk for preterm labor. A low CS rate reported in our study suggests that most of these women were low risk women admitted with preterm labor pains and delivered vaginally.

In present study, on analyzing the contribution of each group to overall cesarean section rate we found group 5, which consists of multiparous women, with at least one previous section and single pregnancy in cephalic presentation at term, was the largest contributor to overall caesarean section rate followed by group 1 and 2 with relative contribution of 38.69%, 19.12% and 17.13 respectively. Similar findings were noted by Prameela RC et al, Gilani et al, Kazmi T et al and Gomathy E et al<sup>8,10,13,16</sup>. In a study by Tura AK et al conducted in Ethiopia a low income country, group 3 was the highest contributor while group 5 was the second highest contributor to the overall CS rate, a finding different from our study, this may be related to variation in population demographics and fertility trends<sup>19</sup>. Joshua P Vogel et al reported that in all three HDI (Human development index) groups, nulliparous women (group 1 and 2) were the single largest contributor to the overall caesarean section rate followed by women in group 5. In moderate HDI countries largest contributor was the group 5 and in low HDI countries in WHO Global survey, group 1 was the largest contributor to the overall caesarean section rate but in WHO multicountry survey (2010-2011), group 5 was the largest contributor. In high HDI countries the proportion of nulliparous women increased which probably represents trend towards reduced parity in these countries<sup>9</sup>.

Group 1, 2 and 5 when combined contributed to 74.94% of all cesarean sections performed during the study period, a finding similar to other studies. These three groups should be the focus of attention to lower the overall CS rate. Prevention of primary caesarean section should be our goal so that lesser number of women will enter their next pregnancy with a uterine scar and there will be more chances of getting them delivered vaginally, so that a meaningful reduction in overall cesarean section rate can be achieved.

In present study group 6 (nulliparous breech) was the fourth largest contributor to CS rate (relative contribution of 9.69%), while in study by Arpita Y Reddy et al group 10 was the fourth largest contributor<sup>12</sup>. Cesarean section rate was high in group 7 (69.07%), 8 (41.08%) and 9(94.91%). But they represent small percentage of obstetric population and therefore their contribution to the cesarean section rate is low. Relative contribution of group 7, 8, 9 and 10 was 1.5%, 1.25%, 1.27% and 2.93% respectively. Our results were comparable with other studies<sup>8,12,13</sup>.

Limitation of our study is that we have not subdivided groups 2, 4 and 5, which could help us in planning the implementation of clinical interventions in specific subgroups. Also Robson’s classification does not include indications of cesarean section and perinatal outcome. This information can be added and analyzed between the groups to optimize cesarean section rate within the groups while ensuring good maternal and perinatal outcome.

## Conclusion

“Robson’s ten group classification system” helps us to identify the main groups of subjects who contribute most to the overall CS rate. In present study as women with previous cesarean section constitute the most important determinant of overall cesarean section rates, evidence based labor management protocols and labor induction protocols should be strictly followed by obstetric units to optimize cesarean section rates among nullipara to keep a check on the size of group 5.

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**Conflict of interest:** None. **Disclaimer:** Nil.

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