10.5005/jp-journals-10006-1161

REVIEW ARTICLE

Audit: The Strategy to Reduce the Rising Cesarean Section Rates

Malik Goonewardene, Miyuru H Manawadu, DV Priyaranjana

ABSTRACT

The global increase of cesarean sections (CS) is causing great concern because of the associated increased maternal mortality and severe morbidity, even after adjusting for risk factors. To address this issue an audit is required. Robson's 10 group classification of CS, in which all pregnant women are categorized into 10 prospectively determined, mutually exclusive, totally inclusive and clinically relevant groups, modified by the inclusion of a few subgroups, has been used in certain centers in Sri Lanka from 2010. Using this classification, it is possible to study the pattern of CS in a particular unit during a specific period of time and compare the data prospectively, as well as carry out comparisons with data from another unit which has adopted this classification.

Audits and comparisons at local, regional, national and even international levels are possible. When the pattern of CS in a particular unit is recognized, a detailed analysis of CS including the indications for CS is required to decide whether the CS rate needs to be reduced and if so how it could be reduced. A subsequent reaudit using the same categories would demonstrate reducing trends if any, after the adoption of appropriate changes in clinical practice, and also identify areas which require further improvements. Important differences between units have been observed in those groups which contribute to almost half the total CS; *viz* 5A and 5B (repeat CS), 2B (nulliparous term singleton vertex–NTSV, prior to the onset of labor), 2A (NTSV after induction of labor) and 1 (NTSV in spontaneous labor). Detailed analysis of indications for CS in these groups have revealed possible areas where clinical practice can be changed and CS rates safely reduced, without increasing the risk of adverse outcomes for the mother or her baby.

Keywords: Audit, Cesarean section.

How to cite this article: Goonewardene M, Manawadu MH, Priyaranjana DV. Audit: The Strategy to Reduce the Rising Cesarean Section Rates. J South Asian Feder Obst Gynae 2012;4(1):5-9.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

Worldwide, cesarean section (CS) rates are estimated to vary from approximately 0.4% in Chad, Central Africa to approximately. 40.5% in China with an average of approximately 15%. In general CS rates are low in Africa and high in Latin America. The mean CS rates in Asia and the Oceania regions are estimated to be 15.9 and 14.9% respectively, with Nepal having the lowest estimated rate of 1% and Sri Lanka having an estimated CS rate of 30.6%.[1-3] CS rates have been found to vary from 20 to 38% and 47% in public, charitable and private sector clinics in India.[4] In Latin America the median CS rate in private hospitals was found to be 51% (quartile range 43-57).[2] In certain centers in Brazil, CS rates of 70 to 80% have been reported.[5] Globally, the increased rates of CS have been shown to be positively associated with maternal mortality and severe morbidity, even after adjusting for risk factors.[2,6-8] Therefore, there is great concern regarding the morbidity associated with CS, and in many centers there are concerted efforts to try and reduce the rising CS rates.[2,9-15]

In 1985, the World Health Organization recommended an optimum CS rate of 10 to 15% and stated that there was no justification for any region in the world to have higher rates than this.[16] However, even up-to-date there is no consensus regarding what the correct CS rate should be and how we should get there.[17,18]

In order to address this issue of the rising CS rates it is important to first carry out an audit to identify the indications and the factors which lead to CS. Robson's 10 group classification of cesarean sections could be used for this purpose.[19,20] In Robson's classification, all pregnant women are categorized into 10 prospectively determined, mutually exclusive, totally inclusive and clinically relevant groups of women. In Sri Lanka, we have modified it by including subdivisions to some of these groups in order to facilitate easy analysis and comparison. These subdivisions are to separate CS after induction of labor (IOL) from CS prior to onset of labor and CS after one previous CS from CS after more than one previous CS (Table 1).

Using this modified 10 groups of pregnant women, it is possible to study the indications and factors leading to CS in one unit during a particular period and compare the data prospectively as well as carry out comparisons with any other unit which has adopted this classification. This would enable audits and comparisons at local, regional, national and even international level. This would also enable each unit to decide whether its CS rate needs to be reduced and if so how it could be reduced.

The objective of the current study was to describe the rising trends in CS in the academic unit of the THMG during the last 25 years and identify the indications and factors responsible for this increasing trend. This would enable a reduction in the CS rates in the academic unit of THMG, if appropriate and possible.

MATERIALS AND METHODS

The CS rates in the academic unit of the THMG documented during the period 1985 to 2010 were analyzed, to study the trends in CS rates and the indications for CS during this period. Next, using the modified 10 groups of CS, the indications and factors leading to CS, and the perinatal and maternal outcome, were analyzed during the period 1st March to 31st December 2010.

Table 1: Modified 10 groups of pregnant women

1. Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation, in spontaneous labor.
2. A. Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation, who have induction of labor.
   B. Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation, who are delivered by cesarean section prior to the onset of labor.
3. Multiparous women without a previous uterine scar, with a single cephalic pregnancy at greater than or equal to 37 weeks gestation in spontaneous labor.
4. A. Multiparous women without a previous uterine scar, with a single cephalic pregnancy at greater than or equal to 37 weeks gestation, who have induction of labor.
   B. Multiparous women without a previous uterine scar, with a single cephalic pregnancy at greater than or equal to 37 weeks gestation, who are delivered by cesarean section prior to the onset of labor.
5. A. Multiparous women with one previous uterine scar and a single cephalic pregnancy at greater than or equal to 37 weeks gestation.
   B. Multiparous women with more than one previous uterine scar and a single cephalic pregnancy at greater than or equal to 37 weeks gestation.
6. Nulliparous women with single breech pregnancy.
7. A. Multiparous women with a single breech pregnancy, without previous uterine scar/s.
   B. Multiparous women with a single breech pregnancy, with previous uterine scar/s.
8. A. Women with multiple pregnancies without previous uterine scar/s.
   B. Women with multiple pregnancies with previous uterine scar/s.
9. A. Women with a single pregnancy with a transverse or oblique lie, without previous uterine scar/s.
   B. Women with a single pregnancy with transverse or oblique lie with a previous uterine scar/s.
10. A. Women with a single cephalic pregnancy at less than or equal to 36 weeks gestation, without previous uterine scar/s.
    B. Women with a single cephalic pregnancy at less than or equal to 36 weeks gestation, with previous uterine scar/s.

RESULTS

The CS rate in the academic unit of the THMG has increased from 13% in 1985 to reach 32% in 2007, decreased to a low of 25.8% in 2008 and has increased again to 31.8% in 2010 (Fig. 1).[9,21,22] During the period of study 1st March to 31st December 2010, there were 4633 maternities with 4689 total deliveries of which 40 were still births. Of the 1493 CS carried out in the unit during this period the data from 1467 (98.25%) were available for analysis.

A previous CS remained as the leading indication for CS and accounted for approximately one in three CS carried out during the period 1985 to 2010, and showed a progressive increase from 1985 to 2010 (Table 2). The proportion of CS carried out for failure to progress in labor and fetal distress has shown an increase from 1985/86 to 1999 and 1999 to 2010 respectively. The proportion of CS carried out for failed IOL has shown a decrease from 1999 to 2010.

During the period 2008 to 2010, there has been a progressive decrease in the proportion of normal vaginal deliveries and a significant increase of CS rates. The proportion of instrumental vaginal deliveries and assisted vaginal breech deliveries has also decreased (Table 3). No significant changes were noted in the perinatal outcome, and the number of mothers requiring intensive monitoring or intensive care. Although the number of maternal deaths was relatively high in 2008, no significant trend was noted (Table 4).

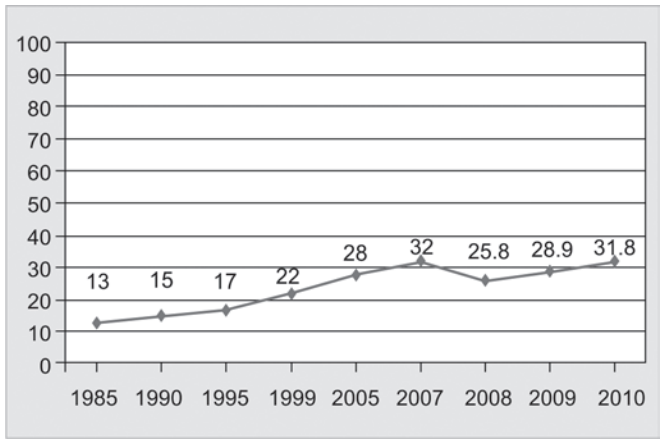


Fig. 1: Cesarean section rates: 1985 to 2010

In 2010, Group 5A: Repeat CS after only one previous CS scar (21%) was the leading contributor to the overall CS rate. Only 15% of women with one previous CS scar had a successful vaginal birth after cesarean section (VBACS).

Group 2B: Elective CS in nulliparous women at term with a singleton vertex presentation (NTSV) had the second largest contribution (14.2%). Group 2A: Emergency CS in NTSV after IOL, group 5B: repeat CS after 2 or more previous CS and group 1: Emergency CS in NTSV after spontaneous onset of labor were the next three causes (Table 5). The groups 5A, 2B, 5B, 1 and 2A contributed 62.2% of the total CS carried out during this period. The contribution of the other groups is shown in Table 6.

Of the 621 primigravidae who had a CS, 470 (76%) belonged to the category of NTSV resulting in a CS rate of 25% in NTSV. A diagnosis of antepartum or intrapartum fetal distress was the leading indication for CS in this group with failure to progress in labor and failed IOL being the next two indications. (Table 7). Although failed IOL accounted for only 2.5% of the total CS in 2010, there were an additional 51 (3.4%) CS due to a cervix unfavorable for IOL.

Of the 846 multiparous women who had a CS, 217 (26%) were at term with a singleton vertex presentation and no previous uterine scar. A diagnosis of antepartum or intrapartum fetal distress was the leading indication for CS in 90 (41%) of women in this group and failure to progress in labor or failed IOL being the second indication (Table 8).

DISCUSSION

The reason for the dramatic reduction in CS rates from 32% in 2007 to 25.8% in 2008 is not clear. Thereafter, the progressive and significant increase in CS rates to 32.2% in 2010 is of concern. From 1985 a previous CS has been associated with one in three women undergoing a CS and the rising trend in

Table 2: Indications for cesarean sections: 1985 to 2010

	1985-86 (12 months)	*1999 (3 months)*	*2010 (10 months)*
Total cesarean sections	811	349	1493
Previous cesarean section (%)	243 (30)	112 (32)	531 (35.6) p < 0.05
Fetal distress (%)	170 (21)	45 (13)	333 (22.3) p < 0.001
Failure to progress in labor (%)	41 (5)	31 (9) p < 0.001	161 (10.8)
Failed induction of labor (%)	41 (5)	28 (8)	37 (2.5) p < 0.001
Severe preeclampsia (%)	Not known	9	6.6

Table 3: Mode of delivery: 2007 to 2010

	2007	*2008*	*2009*	*2010 (10 months)*	*p*
Total deliveries	4610	4973	5021	4689	–
Normal vaginal deliveries (%)	65.4	70.9	69.1	65.4	<0.001
Cesarean sections (%)	32.1	25.8	28.9	31.8	<0.001
Forceps deliveries (%)	0.5	0.8	0.4	0. 6	<0.05
Vacuum deliveries (%)	2.0	1.6	0.8	0.9	<0.001
Assisted vaginal breech deliveries (%)	0.6	0.9	0.8	0.5	<0.05

Table 4: Maternal and perinatal outcome: 2007 to 2010

	2007	*2008*	*2009*	*2010 (10 months)*	*p*
Still birth rate/1000 deliveries	6.9	9.9	8.8	8.5	Not significant
Neonatal mortality rate (NMR)/1000 live births	6.1	8.1	5.2	5.6	Not significant
<28 weeks NMR/1000 live births	Not known	0.8	2.0	1.5	Not significant
Perinatal mortality rate/1000 deliveries	Not known	17.9	13.9	13.6	Not significant
Admissions to special care baby unit (%)	Not known	Not known	7.2	6.5	Not significant
Maternal admissions for monitoring or intensive care (%)	1.9	1.5	1.8	2.0	Not significant
Maternal deaths	2	6	2	1	Not significant
Total live births	4578	4924	4977	4649	–

Table 5: Main contributions to the high cesarean section rates: 2010

Groups	*Description*	*No. of CS*	*% of total CS*
5A	Multip 1 previous scar, single, cephalic ≥ 37 weeks	313/369 (85%)	21.0
2B	Nullip, single cephalic, ≥ 37 weeks, prior to the onset of labor	212	14.2
2A	Nullip, single cephalic, ≥ 37 weeks, who have induction of labor	160/554 (29%)	10.7
5B	Multip >1 previous scar, single cephalic ≥ 37 weeks	146/169	9.8
1	Nullip, single cephalic, ≥ 37 weeks, in spontaneous labor	98/1095 (9%)	6.5

Multip: Multiparous, Nullip: Nulliparous

Table 6: Contribution by the other groups to the high cesarean section rates

Groups	*Description*	*No. of CS*	*% of total CS*
10A	<37, singleton vertex in nullip/multip without uterine scar	90/158 (57%)	6.0
4B	Multip at ≥ 37 weeks, prior to onset of labor	87	5.8
6	Primi breech	77/97 (79%)	5.2
4A	Multip after induction of labor at ≥ 37 weeks	74/303 (24%)	5.0
3	Multip after spontaneous onset of labor at ≥ 37 weeks	56/1418 (4%)	3.8
7A	Multibreech	36/38 (95%)	2.4
All other groups	7B, 8A, 8B, 9A, 9B, 10B	118/133	7.9

Multip: Multiparous, Nullip: Nulliparous

this percentage (30% in 1985 to 35.6% in 2010) is worrying. Therefore there is a great need to control the primary CS rate in primigravida and also allow more women with one CS scar a trail of VBACS in order to control the snow ball effect. Increased number of women undergoing CS in groups 1, 2A and 2B will increase the size of group 5A which in turn will increase the number in group 5B.

'The standard primipara'[23] or the 'nulliparous term singleton vertex' (NTSV)[24] is considered to be a good basis for comparison of CS rates prospectively in a unit or in between units. To carry out a CS in a woman in this category, it should be obstetrically justified as it will have a great impact on her future child bearing. CS rates ranging from a low of 13%[25] to a high of 34.2% [24] have been reported.

Table 7: Indications for cesarean section in nulliparous women at term with a singleton vertex presentation (n = 470/1861)

Type of CS / *Indication*	*Group 2B Elective CS (n = 212)*	*Group 2A Emergency CS after IOL (n = 160)*	*Group 1 Emergency CS after spontaneous onset of labor (n = 98)*
Fetal distress	23%	46%	53%
Failure to progress in labor	–	29%	41%
Failed induction of labor (IOL)	–	18%	–
Primary subfertility	14%	–	–
Elderly mother	9%		
Antenatal diagnosis of cephalopelvic disproportion	7%	–	–
Cervix unfavorable for IOL	7%	–	–

CS: Cesarean section

Table 8: Indications for cesarean sections in multiparous women at term with a singleton vertex presentation and no previous uterine scar (n = 217/1808)

Type of CS / *Indication*	*Group 4B Elective CS (n = 87)*	*Group 4A Emergency CS after IOL (n = 74)*	*Group 3 Emergency CS after spontaneous onset of labor (n = 56)*
Fetal distress	17%	61%	54%
Failed induction of labor (IOL)/failure to progress in labor	–	30%	29%
Vaginal varices	22%	–	–
Bad obstetric history	11%	–	–

CS: Cesarean section

The fact that 30.5% of primigravida had a CS in 2010 is of great concern. Furthermore of the 621 primigravida who underwent CS, 76% were in the category of NTSV and the CS rate in NTSV was 25%. If the rising CS is to be reduced, the reasons for the primary CS in this group need to be carefully analyzed. Of the 212 women who had an elective CS, the two main indications were a diagnosis of antepartum fetal distress (23% of the 212) and subfertility (14% of the 212).

Of the total 1493 CS carried out during the study period in 2010, 332 (22.2%) were due to a diagnosis of fetal distress. The cardiotocograph (CTG) which is commonly used to detect fetal distress is well known to have a poor specificity resulting in a large number of false-positive results (a nonreactive CTG) which could lead to an increased number of CS. If the diagnostic specificity of fetal distress is improved, the number of women having a CS for suspected fetal distress will be reduced. This could reduce the CS rate in the NTSV category (groups 1,2A and 2B).

In 1999, 27% of women with one previous CS had been allowed a trail of VBACS of whom 76% had been successfully delivered vaginally, i.e. 20% of successful VBACS after one previous CS.[9] However, successful VBACS after one previous CS was only 15% in 2010. With better selection of women for a trial of VBACS, an improvement in successful VBACS rate is anticipated in the future.

Group 5 (multiparous women, with at least one previous uterine scar and a single cephalic pregnancy at greater than or equal to 37 weeks gestation), group 2 (nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation, who have induction of labor or who are delivered by cesarean section before the onset of labor) and Group 1 (nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation, in spontaneous labor), in order of priority mainly contribute to the CS rate. Therefore, the percentage of CS in each of these groups and the size of each of these groups will greatly affect the overall CS rate.

The fact that 79% of primigravidae with singleton breech presentations at term had CS is of concern, especially as this category (group 6) contributed to 5.2% of the total CS. Although the contribution to the overall CS rate was low the fact that 95% of multiparous women with singleton breech presentations at term had CS is also of concern.

Consequent to the results of the audit in 2010, the following measures have been adopted in the academic unit of the THMG:

1. Increased use of fetal acoustic stimulation test (FAST) to complement cardiotocography (CTG) for antepartum and early intrapartum fetal monitoring.[26,27]
2. Use of fetal blood sampling to complement intrapartum CTG.
3. Establishing a definite obstetric indication prior to carrying out a CS in a primigravida by carrying out a comprehensive assessment.
4. A comprehensive assessment (including sonographic assessment of fetal size and clinical pelvimetry) in patients with previous CS and selecting more of them to undergo a trial of VBACS.
5. Increased and appropriate use of preinduction cervical ripening agents prior to IOL.
6. Improved management of IOL using an intravenous oxytocin infusion protocol and guideline.[28]
7. Offering ECV to all women with an otherwise uncomplicated breech presentation at 36 to 37 weeks gestation.
8. Allowing more assisted vaginal breech deliveries in properly selected women.

CONCLUSION

An audit and a detailed analysis of indications for CS have enabled the identification of possible remedial measures which could be adopted to reduce the rapidly rising CS rates. With the adoption of these measures, a significant reduction of CS rates is expected in the future.

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ABOUT THE AUTHORS

Malik Goonewardene

Senior Professor and Head, Academic Department of Obstetrics and Gynecology, Teaching Hospital, Mahamodara, Galle, Sri Lanka

Miyuru H Manawadu

Pre-Intern Medical Officer, Academic Department of Obstetrics and Gynecology, Teaching Hospital, Mahamodara, Galle, Sri Lanka

DV Priyaranjana

Pre-Intern Medical Officer, Academic Department of Obstetrics and Gynecology, Teaching Hospital, Mahamodara, Galle, Sri Lanka

CORRESPONDING AUTHOR

Malik Goonewardene, Senior Professor and Head, Department of Obstetrics and Gynecology, Faculty of Medicine, University of Ruhuna, PO Box 70, Galle, Sri Lanka, Phone: +94-91-2246878 Fax: +94-91-2222314, e-mail: malikg@eureka.lk