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Original Research Article

Analyzing indications for caesarean delivery in a tertiary care facility in India by Robsons Ten Group Classification System: journey to reduce maternal mortality-audit caesarean rates: a prospective observational design

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ABSTRACT

Background: Rising caesarean rates pose a challenge to obstetricians, the healthcare system, and the national economy. High rate of caesarean without clear evidence of a decrease in maternal and neonatal morbidity is matter of concern. The era of impatient obstetricians, and caesareans on demand are major contributing factors. The purpose of this study is to validate TGCS classification for indications of caesarean. This would help to audit and streamline the indications of caesarean. Standardization of indications is the need of the hour. Learning from what has happened in background of local situations is the main aim of this work.

Methods: In a prospective observational design, 1140 women who underwent caesarean for varied indications in C R Gardi Hospital Ujjain were recruited. Patients were classified according to Robson's Ten Group Classification System. Every woman was observed for post-caesarean morbidities like wound dehiscence, anemia, postpartum hemorrhage, and puerperal sepsis. Neonates were observed for NICU admission, low birth weight, prematurity, respiratory distress syndrome, meconium aspiration syndrome, and death. Chi-Square and student t test were used for analysis.

Results: 45.8% of women were of group 5. Modifiable indications were 60.2% in the primary caesarean of group 5. PPH, puerperal sepsis, PNC anemia, wound dehiscence, DVT, rupture uterus and NICU admission, respiratory distress syndrome of neonates were significantly high in group 5 ($p = \text{less than } 0.05$).

Conclusions: Out of all caesarean 45.8% are second caesarean for previous one caesarean. PPH, puerperal sepsis, wound dehiscence and PNC anemia are significantly high in group 5.

Keywords: Caesarean Section, Maternal Morbidity In Caesarean, Rising Caesarean Rates, Robson's Ten Group Classification.

INTRODUCTION

Exponentially high rates of caesarean in the early 21st century have created a second-look challenge to the obstetrician community worldwide. Rates have doubled from 15% to around 30% and are even as high as 50% in Latin America, Brazil, Western Europe, and North

America.¹ The rapid increase in caesarean section (CS) rates without clear evidence of a concomitant decrease in maternal or neonatal morbidity or mortality, raises significant concern that caesarean delivery is overused.² WHO advocates equal justice for all labouring women for having vaginal or caesarean delivery in the better interest of the mother and fetus.³ In affluent societies and urban facilities which cater to peripheral women in India, the

place of CS is questionable. However, for low-risk conditions, CS delivery appears to pose more risk than vaginal delivery.⁴ Vaginal birth is a natural process. Rising rates should not be an adverse outcome of the availability of more experts in obstetrics. One of the modifiable indications is CS on demand. Data available on comparison between CS on maternal request and planned vaginal birth are scarce. ACOG recommends that CS on maternal request should not be entertained in absence of other maternal indications and not before 39 weeks of gestational age. Given the high repeat caesarean delivery rates, patients should be informed that the risks of placenta previa, placenta accreta, and obstetric hysterectomy increase with each subsequent caesarean delivery.⁵ In a socioeconomic set-up, as is in India, women with a caesarean for modifiable indication in first delivery are victims of a long-term high-risk obstetric career. The main challenge is to find what is wrong and where it lurks.

In this study, we have carried out surveillance of present CS indications in our setting. To streamline, we used Robson's Ten Group Classification System for standardizing the overall clinical scenario. WHO proposes the Robson classification system as a global standard for assessing, monitoring, and comparing caesarean section rates within healthcare facilities over time, and between facilities.³ We aim to present and compare various groups to search for the ones that have adverse maternal and fetal outcomes. Also by searching for modifiable indications, we may be able to propose a model which endorses a rational and scientific approach to the child-birthing process.

METHODS

This was a prospective observational study carried out in C.R. Gardi Hospital, Ujjain. One thousand one hundred and forty women were recruited. The study was carried out from November 2019 to October 2021 (24 months). The recruitment criterion was any patient who underwent caesarean delivery for varied indications. In our Obstetric department, we had been receiving patients coming directly on their own or referred by any other facility. Women having elective as well as emergency caesareans were included. The indications for CS were decided by the treating consultant based on their own judgment. In this observational design, we noted demographic data, post-caesarean morbidities like wound infection and dehiscence, anemia, postpartum hemorrhage, puerperal sepsis, and many other clinical findings. Patients were classified according to Robson's Ten Group Classification System (TGCS).⁶

Mainly based on five parameters such as obstetric history (parity and previous caesarean section), the onset of labor (spontaneous, induced, or caesarean section before the onset of labor), fetal presentation or lie (cephalic, breech, or transverse), number of fetuses, and gestational age (preterm or term), groups were formed.⁷ The groups and

criteria for defining a particular group are shown in (Table 1).

Table 1: TGCS classification.

TGCS Class	Definition
1	Nullipara, singleton pregnancy, cephalic presentation, gestational period 37 weeks or more and spontaneous labor.
2	Nullipara, singleton pregnancy, cephalic presentation, gestational period 37 weeks or more and induced labor or CS before labor.
3	Multiparous, without previous CS, single, cephalic, gestational period 37 weeks or more and spontaneous labor.
4	Multiparous, without previous CS, single, cephalic, gestational period 37 weeks or more and induced labor or prelabor C-section.
5	Multiparous with prior CS, single, cephalic and gestational period 37 weeks or more.
6	All nulliparous breech.
7	All multiparous breech, including previous CS.
8	All multiple pregnancies including previous CS.
9	All pregnancies with transverse lie or oblique including previous CS.
10	Single, cephalic, less than 36 weeks including previous CS.

Every woman was observed for various outcomes. For considering Postpartum Hemorrhage (PPH), blood loss of more than 500 ml in vaginal delivery and more than 1000 ml in CS was the reference parameter. For defining puerperal sepsis, the following criteria were followed; fever more than 100°F, total WBC count more than 10000/cumm, presence of foul-smelling vaginal discharge and tenderness on the uterus. The cases were put under "anemia in the post-partum period" when the hemoglobin level was 10 g% or less than that. Patients were placed under "Deep vein thrombosis (DVT)" when the patient had either calf muscle tenderness or documentation of peripheral vein occlusion in a color Doppler study.

We defined fetal outcomes under prematurity for a gestational period of fewer than 37 weeks; low birth weight when fetal weight was less than 2.5 kg. The presence or absence of meconium was another criterion for bad fetal outcome. Admission to the neonatal intensive care unit (NICU) and the presence or absence of respiratory distress syndrome was also other adverse outcome. We analyzed the data by grouping all women in various TGCS classes. Our main focus was on class 5. This was the class having previous CS for any indication. These

were the women who could have a vaginal birth after a caesarean (VBAC). Out of 1140 women in our study, 522 were in class 5; had they not had a previous caesarean they would have delivered vaginally. This article focused on this class that had been left to unnecessary repeat section. Multivariate analysis in SPSS was used to co-relate the various maternal and fetal outcomes in various classes. The association and significance of variables were calculated by Chi-square and student t-test; a P value less than 0.05 was considered to be significant. Data analysis was carried out by SPSS software. The proposal was approved by the Institutional Ethics Committee. (ECR/113/Inst/MP/2020. CDSCO).

RESULTS

Majority of study subjects were of age group between 21-30 years. They are mostly illiterate belonging to lower socio-economic status and from rural background. High rate of referral is due to the presence of only one tertiary care centre with all facilities which caters to the population nearby (Table 2).

Looking at the observations in the study it is seen that group 5 is the leading cause of rising caesarean rates. This group 5 includes women who resulted in repeat caesarean section due to the primary caesarean section. Contribution

of second caesarean after first appears to be quite high (45.8%) (Table 3).

Table 2: Distribution of sociodemographic variables.

Variables	Categories	n (%)
Age groups (years)	≤20	147 (13)
	21-30	934 (81.9)
	>30	59 (5.2)
Referral	Yes	461 (40.4)
	No	679 (59.6)
Education	Illiterate	401(35.2)
	Middle	384 (33.7)
	High school	213 (18.7)
	Higher secondary	71 (6.2)
	Graduate	71 (6.2)
Occupation	labourer/farmer	336 (29.5)
	Housewife	804 (70.5)
SES	Lower	661 (58)
	Upper	479 (42)
Locality	Urban	201 (17.6)
	Rural	939 (82.4)
Admission	Elective	95 (8.3)
	Emergency	1045 (91.7)
Total		1140 (100)

Table 3: Distribution of women according to various TGCS Class.

TGCS groups	1	2	3	4	5	6	7	8	9	10
n	204	32	118	26	522	90	44	16	22	66
%	17.9	2.8	10.3	2.3	45.8	7.9	3.9	1.4	1.9	5.8

Table 4: Indications of CS in 1st delivery in Group 5 women.

	Indications	No of cases of 2 nd caesarean section	Percentage
Non-Modifiable	Contracted pelvis and CPD	108	20.7
	Transverse lie	28	5.4
	Breech	64	12.2
	Obstructed labour	8	1.5
Modifiable	Failure to progress	74	14.2
	Fetal distress	116	22.2
	Induction of labour for non-justifiable indication	46	8.8
	Post-dated pregnancy	18	3.4
	Caesarean on demand	12	2.4
	Others	48	9.2
Total		522	100

This study throws light on the fact that major share of primary caesarean is done for modifiable indications. These patients if would have been given a patient trial of labor could have resulted in vaginal delivery (Table 4). 60.2 % of group 5 women had modifiable indication in 1st

delivery. It is observed that intraoperative and postoperative morbidities are more in group 5. Repeat caesarean section contributes to more blood loss, more risk of infection which leads to PPH, PNC anemia, puerperal sepsis and wound dehiscence. Uterine rupture is more

common in repeat caesarean due to weak scar of primary caesarean. (Table 5).

Table 5: Comparison of maternal morbidity in group 5 and others.

Maternal outcome	Group 5 N=522	Others (n=618)	P
PPH	52 (9.96%)	38 (6.15%)	0.01
Puerperal sepsis	21 (4.02%)	8 (1.29%)	0.003
DVT	12 (2.3%)	5 (0.81%)	0.038
Wound Dehiscence	53 (10.15%)	32 (5.18%)	0.001
PNC anemia	164 (31.42%)	54 (8.74%)	0.000
Rupture	7 (1.34%)	0	0.003

PPH, puerperal sepsis, PNC anemia, wound dehiscence and rupture uterus were significantly more in group 5 as compared to others.

NICU admission, respiratory distress syndrome and meconium aspiration syndrome are found to be more in group 5 as these repeat caesareans was done as result of fetal jeopardy. Low birth weight and prematurity is the outcome of justified CS (Table 6).

Table 6: Comparison of neonatal morbidity in group 5 and others.

Neonatal outcomes	Group 5 (n=522)	Other (n=618)	P
NICU admission	176 (33.72%)	83 (13.43%)	0.000
Prematurity	72 (13.79%)	121 (19.58%)	0.009
LWB ^α	156 (29.89%)	132 (21.36%)	0.000
Meconium aspiration	150 (28.74%)	59 (9.55%)	0.000
RDS ^β	52 (9.96%)	37 (5.99%)	0.012
Death	17 (3.26%)	29 (4.69%)	0.218

^α -Low birth weight, ^β-respiratory distress syndrome

NICU admission and respiratory distress syndrome were significantly high in group 5.

DISCUSSION

It has been felt for a long time that there is a need for attention to a uniform system of classification of indications. Robson first introduced such a system in the year 2001.

The obstetric status of a woman in labour was considered a basic parameter for classification. All women undergoing CS fall into one of these groups. This provides specific indicators for comparing the number of women undergoing CS in each group.

Besides, it offers a uniform comprehensive system to recognize what measures are inadequate and where issues could go wrong as far as the rising rates of CS are concerned. The validity and usefulness of TGCS have also been supported by many authors.^{8,9} Uniformity in the classification system helps develop a registry for data on CS rates, particularly for an Indian setting. As a step further, analysis, audits, and remedies at Central Ministry for Health and Family Welfare in India are needed to allay rising rates.

In this research, we identified 1140 caesarean patients. The main idea was to find out which were the commonest indications for CS. As classes 6, 8, 9, and 10 are absolute indications, we have nothing to comment on these rather lifesaving measures. Class 5 is vulnerable. The present caesarean delivery in this class has been the result of some situations in the previous CS. Small bony pelvis, malpresentation, and placenta previa are absolute indications where nothing can stop an obstetrician from resorting to a CS. But, issues such as the abnormal uterine action, a fibrosed cervix, a thin lower segment scar, and placenta previa are all resultants of the previous scar. The dealing obstetrician's patience and good concrete decision-making ability are boons to clients of that particular health facility.

In this study, our results showed that class 5 was the maximum contributor to CS delivery with a percentage of 45.8 followed by group 1 and group 3. In group 5, 60.2% of caesarean sections in the 1st delivery were done for modifiable indications. Of that, a major share was taken by fetal distress (22.2%); followed by failure to progress, which included women who resulted in caesarean section due to dilatation of less than 1 cm per hour in the active phase of labor despite adequate uterine contractions (Table 4).

Other modifiable indications included induction of labor for non-justifiable indications, postdated pregnancy, and caesarean on demand. Other studies on similar lines also indicated that a higher number of primary caesareans were done for fetal distress and failure to progress which are modifiable indications.¹⁰⁻¹⁴

These caesarean sections are a result of failure in proper judgement or due to the impatience of both obstetricians as well as patients. A study on the analysis of the cesarean section rate in Oman concluded that groups 1, 2 and 5 contributed 60% of indications.¹⁵ A recent study in Ethiopia reported that the largest contributors to the overall CS rate were group 10 (19.1%), group 2 (18.3%), group 5 (17.1%), and group 4 (15.8%). They found high rates of pre-labor CS in group 2, group 4, and group 10; group 10 was the leading contributor to the overall CS rate.¹⁶ This study also revealed a high rate of CS among low-risk groups and called for more in-depth analysis to identify possible modifiable factors and to further apply specific interventions to reduce the CS rate.¹⁷ These comments by these authors were consistent with our recommendations

for revising decisions in modifiable groups. A study from Brazil quoted the overall CS rate being 51.9% and the highest contributors were groups 2, 5, and 10 (70%).¹⁸ A WHO multidisciplinary survey reported overall increased rates from 26.4% to 31.2% from the year 2004 to 2011.¹⁹ Increased rates of induction and prelabor CS were pointed out. Group 5 rates also showed a rising trend in middle-income and high-income countries.²⁰ These findings were similar to ours. Many other studies of similar nature had the same observations as ours.^{21,22} Various studies also supported that post-cesarean morbidity was high in group 5. Morbidities like PNC anemia, PPH, puerperal sepsis, and wound dehiscence were 31.4%, 9.96%, 4.02%, and 10.15% respectively which is

comparable to Shah Jitesh Mafatlal et al (2009) showing 1.6%, 2.1%, 1.6%, and 1.6% respectively.¹² Various authors had documented morbidities in group 5 (Table 8).^{12,23-25} Our results showed higher rates than these authors. The fact that the sample size in the studies is quite low in comparison with our study which signifies the higher credibility of our study. Neonatal morbidities like NICU admission, low birth weight, respiratory distress syndrome, prematurity, meconium aspiration syndrome, and neonatal death were 33.7%, 29.8%, 9.96%, 13.7%, 28.7%, and 3.26% respectively which can be compared to studies shown above.²⁶⁻²⁸ The fact that morbidities of neonates mentioned above are due to route of delivery is a questionable issue. But it is an end result of this repeat CS.

Table 7: Comparative distribution of indication of caesarean in primigravida who resulted in 2nd caesarean delivery (group 5).

Indication of Previous CS	Arora et al (2006) ¹⁰ (%)	Rao et al (2008) ¹¹ (%)	Mafatlal et al (2009) ¹² (%)	Bhargava et al (2010) ¹³ (%)	Mahantappa et al (2019) ¹⁴ (%)	Present study (2021) (%)
CPD	51.1	22.64	42.2	36.51	9.96	20.7
Fetal distress	26.9	22.64	21.7	16.89	18.64	22.2
Mal presentation	8.4	14.28	8.3	16.08	19.92	17.6
Failure to progress	5.6	3.83	9.8	8.72	6.43	14.2
APH	3.36	1.74	5.6	2.45	3.21	-
Obstructed labor	0.8	1.74	2.1	3.81	3.21	1.5
Caesarean on demand						2.4
Others	3.64	2.43	5.7	3.81	23.04	9.2

Table 8: Cesarean section and maternal morbidity in group 5.

Maternal outcomes	Mafatlal et al (2009) ¹² (%)	Katke et al (2014) ²³ (%)	Blachandran et al (2014) ²⁴ (%)	Xiao et al (2016) ²⁵ (%)	Present study (2021) (%)
PNC anemia	1.6			3.7	31.4
PPH	2.1	0.8	2.1	1	9.96
Puerperal sepsis	1.6			3.4	4.02
Wound dehiscence	1.6				10.15
Rupture uterus			5.3	0.2	1.34

Table 9: Cesarean section and neonatal morbidity in group 5.

Neonatal outcomes	Loebel et al (2004) ²⁶ (%)	Kamath et al (2009) ²⁷ (%)	Jinturkar et al (2014) ²⁸ (%)	Present study (2021) (%)
NICU admission	2.8	9.3	2.12	33.7
Low birth weight				29.8
Respiratory distress syndrome		2.12		9.96
Prematurity				13.7
Meconium aspiration syndrome		5.8%		28.7
Neonatal death	2.1			3.26

A systematic review addressed maternal and perinatal mortality and morbidity associated with CS in low-and middle-income countries. In LIMCs, the risk of maternal death after CS was 7.5 per 1000 procedures and the highest burden was 10.9 per 1000 in sub-Saharan Africa.²⁹ In

maternal mortality, CS was a 25% contributor. Timing of CS, especially emergency sections and second-stage sections were the key contributors. Considering the outcomes in form of maternal and fetal morbidity, this study documents the morbidity rates comparable to

others.³⁰ A safe mother and healthy baby is the final goal of every pregnancy. Making this goal come true brings immense joy for the family as well as the obstetrician. Maternal morbidity and mortality increase with the increase in caesarean rates worldwide.³¹ There is a steep rise in modifiable indications and caesareans on demand to cut short the labor trauma, be it mental or physical, which adds to the high risk in the next pregnancy and adds up further in raising the numbers. Caesarean section harbors complications like PPH, Anesthetic risks, infections, and pulmonary embolism with it. It also contributes to a series of morbidities in the mother like uterine rupture, placenta previa, and accreta that may lead to obstetric hysterectomy at a very young age. Neonates resulting in iatrogenic prematurity and respiratory distress syndrome are not rare.

Robson ten group classification is a standard classification using which we could assess and validate the indication of caesarean sections. By discouraging the caesarean on demand which is making a new trend of painless labor and by appropriately using other modifiable indications of primary CS, we can reduce morbidity. Improving maternal health is one of our sustainable development goals. We should strive to cut down the total morbidity by reducing the rates of caesarean sections.

Implications

As per guidelines of WHO, FIGO, and FOGSI anonymous caesarean registry is advised for auditing.^{32,33} Robson's TGCS may be followed in all obstetric care facilities to regulate indications for caesarean. Recent studies also support our finding of higher rates in group 5 and in modifiable indications like induction of labor and misunderstood labor dystocia.^{33,34}

CONCLUSION

Overall contributions of 45.8% of women in group 5 is the major conclusion of this research. Addressing modifiable indications in primary caesarean by 60.2% is another finding. PPH, puerperal sepsis, wound dehiscence, PNC anemia and rupture of uterus are significantly high in group 5 as compared to others.

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