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## Original Research Article

# Evaluation of risk factors for intrapartum caesarean section in low risk multiparous women with prior vaginal deliveries

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### ABSTRACT

**Background:** In 2015, WHO proposed the use of the Robson classification as a global standard for assessing, monitoring and comparing caesarean section rates both within and between healthcare facilities. Robson's group 3 and 4 consist of multiparous women with term singleton pregnancies who have previously delivered vaginally and attempts to audit the caesarean sections in these 2 groups may be helpful to reduce primary caesarean sections in multiparous women.

**Methods:** The eligible subjects (belonging to Robson group 3 and 4) were recruited from the labor room of the Obstetrics and Gynecology department of SSG hospital, Baroda. Those who delivered by caesarean section during the study period were enrolled in the study as cases. Those who delivered vaginally immediately following the case formed the controls. Relevant demographic characteristics, parity, interval time between prior birth, history of macrosomic birth, cervical dilatation at the admission to the hospital, obstetric and neonatal outcomes were obtained and analyzed.

**Results:** On performing multivariate regression, age, birth weight of previous child, time since last delivery, cervical dilatation were found to be significant independent risk factors for LSCS after adjusting for confounding factors. The most common indication for caesarean section was fetal distress with meconium stained liquor.

**Conclusions:** In low risk multiparous women with previous vaginal delivery, Maternal age, birth weight of previous child, time since last delivery and cervical dilatation were significant independent risk factors of LSCS. Gestational age, parity, BMI and labor induction were not found to increase the risk of caesarean delivery.

**Keywords:** Caesarean section (CS), Multipara, Previous vaginal delivery

### INTRODUCTION

According to WHO, Caesarean section (CS) rates of 15% are acceptable.<sup>1</sup> This, however, was suggested in 1985 whereas in reality, the caesarean section rates have been increasing steadily and there is a need to revisit the acceptable CS rate.<sup>2</sup> In reality, the CS rates vary from 20-80% in different parts of the world (unmet need and overuse coexisting worldwide) with an average of 21.1%.<sup>3</sup> The rising caesarean section rate is undoubtedly a matter of concern. The reasons for increasing caesarean section rate are previous C-section deliveries, fetal distress, fetal macrosomia, cephalopelvic disproportion, prolonged

labor, advanced maternal age, systemic diseases such as hypertension and diabetes mellitus, multiple pregnancies and malpresentation of fetus. The increasing trend for labor induction also adds to CS rates. Liberalization of CS deliveries for indications like oligohydramnios, IUGR, pregnancies resulting from assisted reproductive techniques and maternal request also lead to more CS deliveries. As compared to vaginal births, CS deliveries are associated with increased maternal morbidity and mortality, reduced fertility, requirement for blood transfusions and ICU admissions and also subsequent caesarean delivery. In 2011, a systematic review and critical appraisal of available classifications for CS

concluded that women- based classifications in general, and Robson's 10-group classification in particular, would be of assistance to fulfill current international and local needs.<sup>4</sup> Robson's classification has been used for audit of CS rates.<sup>5</sup> In 2015, WHO proposed the use of the Robson classification (also known as the 10-group classification) as a global standard for assessing, monitoring and comparing caesarean section rates both within healthcare facilities and between them.<sup>6</sup> The system classifies all women into one of 10 categories that are mutually exclusive and, as a set, totally comprehensive. The classification system is simple to use and enables auditing and analyzing CS rates as it is based on routinely documented obstetrics characteristics of individual woman without relying on the indication for CS. Robson's group 3 and 4 consist of multiparous women with term singleton pregnancies who have previously delivered vaginally. Determination of risk factors in these 2 groups may be helpful in attempting to reduce primary caesarean sections in multiparous women. It is a common belief amongst public that once a mother delivers her child or children normally vaginally, her subsequent deliveries will all be normal vaginal deliveries. As a result such multiparous mothers often neglect routine antenatal checkup and also the mothers and the relatives are reluctant to consent for a caesarean delivery if the need arises.<sup>7</sup> Mainly the fetus and the placenta are responsible for caesarean section in multipara.

A multipara may also have cephalopelvic disproportion even having previously delivered a full term child vaginally. Since the fetus increases in size with multiparity, the size of fetus and fetal head should be carefully estimated. In multiparous patients, malpresentations are favored by a pendulous abdomen and lordosis of the lumbar spine and in any case that is usual for the head not to engage in the pelvis until the onset of labour.<sup>8,9</sup> Multi-parity is a problem associated with low age at marriage, low rate of literacy, low per capita income, high perinatal mortality, preference for male child and ignorance about family planning measure. Some multipara deliver with relative ease even in difficult labour presentations and this gives a false sense of security.<sup>10</sup> This study aims to demonstrate risk factors for CS deliveries in low risk multiparous women who have previously delivered vaginally.

## METHODS

This prospective case control study was carried out at the Department of Obstetrics and Gynecology, Medical College, Baroda over duration of 12 months from 1<sup>st</sup> December 2021 to 30<sup>th</sup> November 2022. The study population consisted of low risk multiparous women with history of previous vaginal delivery and admitted for delivery in this pregnancy at the obstetrics and gynecology department, SSG hospital, Baroda. Inclusion criteria: Multiparous women with prior vaginal delivery. Exclusion

criteria: women with multiple gestation, Previous uterine scar, Maternal fever, Gestational diabetes, Pregnancy-induced hypertension, oligohydramnios, history of chronic systemic disease were excluded from the study. All the low risk multiparous women who delivered by caesarean section during the study period were enrolled in the study as cases and an equivalent number of low risk multiparous women who delivered vaginally formed the control group.

During the study period, 175 cases and 175 controls each were enrolled forming a total sample size of 350. Low risk multiparous women who delivered vaginally immediately following the case formed the controls. The eligible subjects were given a patient information sheet and were enrolled in the study after obtaining a written informed consent to participate in the study. Relevant demographic characteristics, parity, ultrasonographic measurements (sonographic measurements taken within 7 days prior to delivery) including estimated fetal weight (EFW), biparietal diameter (BPD), fetal abdominal circumference (FAC), interval time between prior birth, history of macrosomic birth, cervical dilatation at the admission to the hospital, obstetric and neonatal outcomes were obtained from the case records and entered in proforma.

## RESULTS

This case control study was conducted on 175 low risk multiparous women who delivered by caesarean section were enrolled in the study as cases and 175 low risk multiparous women who delivered vaginally formed control group. Table 1 shows the demographic and clinical characteristics of study subjects. On performing multivariate regression, age (years), birth weight of previous child (grams), time since last delivery (months), cervical dilatation (cm) were significant independent risk factors of LSCS after adjusting for confounding factors. With the increase in birth weight of previous child (grams), risk of LSCS significantly decreases with adjusted odds ratio of 0.997 (0.996 to 0.998). Similarly with increase in cervical dilatation (cm), risk of LSCS significantly decreases with adjusted odds ratio of 0.544 (0.334 to 0.887) respectively. With the increase in age (years) and time since last delivery (months), risk of LSCS significantly increases with adjusted odds ratio of 1.466 (1.282 to 1.675) and 1.245 (1.159 to 1.337) respectively.

This is seen in Table 2. As seen in Table 3, in majority (96 (54.86%)) of patients, indication for caesarean section was fetal distress with meconium stained liquor followed by fetal distress with pathological CTG (55 (31.43%)), fetal distress with cord prolapse (8 (4.57%)), failure of induction of labor (7 (4.00%)), antepartum haemorrhage with abruptio placenta (3 (1.71%)) and non-progression of labor (3 (1.71%)). Indication for caesarean section was deep transverse arrest, fetal distress with placenta previa and obstructed labor in only 1 out of 175 patients (0.57%) each.

**Table: 1 Clinical characteristics of study subjects.**

Variable	Control group	Case group	p-value
Age (years) Mean±SD	25.78±2.5	29.34±3.57	<.0001
Gestational age (weeks)			<.0001
37	34.29%	26.29%	
38	33.14%	26.29%	
39	27.43%	21.14%	
40	5.14%	17.14%	
41	0%	8.57%	
42	0%	0.57%	
Parity (%)			0.273
1 <sup>st</sup>	59.43%	51.43%	
2 <sup>nd</sup>	34.29%	37.14%	
3 <sup>rd</sup>	5.71%	8.57%	
4 <sup>th</sup>	0.57%	2.29%	
5 <sup>th</sup>	0%	0.57%	
Bodymass index (kg/m <sup>2</sup> ) Mean±SD	23.21±2.41	23.27±2.34	0.811
Birthweight of previous child (g) Mean±SD	2964±279.81	2729.14±303.82	<.0001
Roabson group (%)			
3	87.43%	51.43%	<.0001
4	12.57%	48.57%	<.0001
Requirement of induction			
NO (%)	51.43%	52.57%	0.831
YES (%)	48.57%	47.43%	
premature rupture of membranes (%)	77.27%	63.53%	0.224
Post-term pregnancy (> 41 weeks) (%)	22.73%	63.53%	0.224
Cervical dilatation (cm) Mean± SD	2.87±1.22	2.02±0.81	<.0001
Cervical effacement (%) Mean± SD	33.43±17.68	24.26±13.51	<.0001
Birthweight of newborn (grams) Mean±SD	2873.85±241.35	2844.31±201.54	0.215
Apgar scores (Mean ± SD)			
At 5 minute	8.85 0.36	8.85 0.36	1
At 10 minute	8.95 0.22	8.95 0.21	0.804
Neonatal intensive care unit admission (%)	0	4	0.015

**Table: 2: Multivariate logistic regression to find out significant risk factors of LSCS.**

Variables	Beta coefficient	Standard error	P value	Odds ratio	Odds ratio lower bound (95%)	Odds ratio upper bound (95%)
Age (years)	0.382	0.068	<0.0001	1.46555	1.28222	1.67508
Gestational age (weeks)	0.172	0.158	0.275	1.18782	0.8719	1.61821
Birth weight of previous child (grams)	-0.003	0.001	<0.0001	0.99683	0.99559	0.99806
Time since last delivery (months)	0.219	0.036	<0.0001	1.24498	1.15944	1.33683
Cervical dilatation (cm)	-0.608	0.249	0.015	0.5444	0.33404	0.88725
Cervical effacement (%)	0.024	0.017	0.175	1.02382	0.98955	1.05928
Robson group						
3				1		
4	0.675	0.419	0.108	1.96381	0.86325	4.46747
Station						
-3				1		
-2	2.279	3.425	0.506	9.76672	0.01187	8038.06
-1	4.882	4.301	0.256	131.883	0.0288	603992
0	0.380	3.505	0.914	1.46262	0.00152	1409.08

**Table 3: Distribution of indication for caesarean section of study subjects.**

Indication for caesarean section	Frequency	Percentage
<b>Antepartum haemorrhage with abruptio placenta</b>	3	1.71%
<b>Deep transverse arrest</b>	1	0.57%
<b>Failure of induction of labor</b>	7	4.00%
<b>Fetal distress with cord prolapsed</b>	8	4.57%
<b>Fetal distress with meconium stained liquor</b>	96	54.86%
<b>Fetal distress with pathological CTG</b>	55	31.43%
<b>Fetal distress with placenta previa</b>	1	0.57%
<b>Non progression of labor</b>	3	1.71%
<b>Obstructed labor</b>	1	0.57%
<b>Total</b>	175	100.00%

## DISCUSSION

This case control study was done to determine the risk factor of caesarean section in multiparous women. The proportion of patients of age group >30 years, gestational age 40 and 41 weeks, birth weight of previous child between 2000- 2500 grams and 2500-3000 grams, time since last delivery >24 months, Robson group 4, cervical dilatation  $\leq 4$  cm, station -2 was significantly higher in cases as compared to controls and age group 20-25 years, gestational age 37-39 weeks, birth weight of previous child between 3000-3500 grams, time since last delivery 12-24 months, Robson group 3, cervical dilatation >4 cm was significantly lower in cases as compared to controls.

This study demonstrated that maternal age is a significant risk factor for caesarean section in low risk multiparous women with previous vaginal deliveries. Similar findings were observed in a study by Buyuk et al.<sup>11</sup> With increasing gestational age, the incidence of oligohydramnios and meconium stained amniotic fluid increase and this explains the higher caesarean section rate with higher gestational age.

With increasing parity, the birth weight of fetus increases. If a woman has delivered a previous baby with a higher birth weight, the chances of CPD in this pregnancy also reduce. With more time since delivery, the age of the woman also increases.

With induction of labor, the caesarean section rate is found to be higher irrespective of the parity and indication of labor induction. A retrospective study done by Levine et

al. reported that induction of labor increased the caesarean section rate regardless of parity.<sup>12</sup>

A retrospective cohort study was done at Danderyd Hospital, Stockholm, Sweden, during 2002-2006 to assess the risk for emergency caesarean section among women in whom labor was induced in gestational week  $\geq 41$ .<sup>13</sup>

In a hospital-based retrospective cohort study, among women who were induced, the proportions delivered by emergency caesarean section were 42% for nulliparous and 14% for multiparous.<sup>14</sup> Compared to spontaneous onset, this corresponded to a more than threefold increase in risk for nulliparous women and an almost twofold increase in risk for multiparous women.

In a study done by Derbant AU et al, 15 out of the 245, total 83.7% had spontaneous labor and 16.3% were induced, Seventy-five percent of the induced women required CS, whereas only 19.5% of those with spontaneous labor required CS ( $p < 0.001$ ) and the most common indication for primary caesarean section in the multipara in a study was breech presentation.

In the retrospective study by Buyuk et al. C-section indications were fetal distress (33.9%;  $n = 77$ ), macrosomia (20.7%;  $n = 47$ ), cephalopelvic disproportion (16.3%;  $n = 37$ ) malpresentation (14.5%;  $n = 33$ ), failure to progress in labor (12.3%;  $n = 28$ ), and others (2.2%;  $n = 5$ ).<sup>11</sup> This study demonstrated that a lower cervical dilatation at admission was associated with higher incidence of caesarean section. Retrospective study done by Holmes et al. showed that C-section rates were significantly higher in women who were admitted with between 0 and 3 cm of cervical dilatation when compared with women who were admitted with between 4 and 10 cm of cervical dilatation among multiparous women.<sup>16</sup> Bailit et al. demonstrated that cervical examination with less than 4 cm dilatation at admission was associated with significantly increased C-section rates in multiparous women (3.1 versus 1.4%;  $p < 0.001$ ).<sup>17</sup> In a study by Wood et al. in multiparous women, lower cervical dilatation at admission was a modifiable risk factor for C-section. Similar to previous studies, they found that women with cervical dilatation < 5 cm at admission were 2 times more likely to undergo a C-section.<sup>18</sup> The authors also concluded that compared to spontaneous onset of delivery, induction of labor is associated with an increased risk for emergency caesarean section both among nulliparous and multiparous women.

Secondary analysis of a prospective, population-based study by Harrison et al in 2020, found that maternal age over 35, as compared to age 20-35, was associated with a reduced risk of caesarean birth (RR 0.9 (0.86, 0.96),  $p < 0.001$ ) and found that any parity below three was associated with increased risk of caesarean delivery than women with parity of 3 or more; in nulliparous women the relative risk was 2.4 (2.2, 2.5) and in women with parity of 1-2, the relative risk was 1.7 (1.6, 1.8),  $p < 0.001$ .<sup>19</sup>

### Limitations

A small sample size and a single center hospital based study are the limitations of this study.

### CONCLUSION

In low risk multiparous women with previous vaginal delivery, Maternal age, birth weight of previous child, time since last delivery and cervical dilatation were significant independent risk factors of LSCS. Gestational age, parity, BMI and labor induction were not found to increase the risk of caesarean delivery.

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