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# Cesarean sections in a birth center

## ABSTRACT

**OBJECTIVE:** To estimate the prevalence of cesarean sections in a birth center of a hospital and identify factors associated.

**METHODS:** Cross-sectional study including medical records of 2,441 births assisted in a birth center in the city of São Paulo, southeastern Brazil, between March and April 2005. The dependent variable (type of delivery) included vaginal delivery and cesarean section. The independent variables were grouped into four categories: demographic characteristics; current and past obstetric history; intrapartum care; and perinatal outcomes. Prevalence ratios and 95% confidence intervals (95% CI) were estimated to assess the association between type of delivery and maternal and newborn variables.

**RESULTS:** Of all deliveries, 14.9% were cesarean sections. Cesarean section in the current pregnancy was associated with past cesarean sections (PR = 3.19, 95%CI: 2.64,3.84); gestational age >40 weeks (PR = 1.32, 95%CI: 1.09;1.61); cervical dilation of up to 4 cm on admission (PR = 3.22, 95%CI: 2.31;4.50); and meconium-stained amniotic fluid (PR = 2.5, 95%CI: 2.05;3.06). Regarding newborn characteristics cesarean section was associated with birth weight >4 kg (PR = 1.86, 95%CI: 1.29;2.66). Among women with history of past cesarean sections, having had also a prior vaginal delivery was a protective factor for cesarean section in the current pregnancy (PR = 0.46, 95%CI: 0.30;0.71). Factors related to fetal conditions including fetal stress, meconium-stained amniotic fluid, breech presentation and macrosomia accounted for 47.8% (175) while those related to the mechanism of birth including arrest disorders, and functional and rotation dystocia accounted for 31.3% (115) of all indications for a cesarean section.

**CONCLUSIONS:** Prevalence of c-section was consistent with World Health Organization recommendations. Increased risk of c-section was associated with prior history of c-sections, cervical dilation of at least 4 cm upon admission, gestational age > 40 weeks, meconium-stained amniotic fluid, and birthweight > 4 kg.

**DESCRIPTORS:** Natural Childbirth. Cesarean Section. Birthing Centers. Risk Factors. Cross-Sectional Studies.

## INTRODUCTION

Caesarean (c-)section rates are on the rise in practically every country in the world. A study carried out in 126 countries and which included 98% of all live births in 2002 reported c-section rates ranging from 3.5% in Africa to 19.0% in Europe and 29.2% in Latin America. The worldwide rate was 15%, though distribution was irregular.<sup>6</sup> A maternal and perinatal health survey conducted by the World Health Organization (WHO) in eight countries in Latin America (Argentina, Brazil, Cuba, Ecuador, Mexico, Nicaragua, Paraguay, and Peru) reported a C-section rate in public and private institutions of 33%. Of these,

49% were elective, 46% were intrapartum, and 5% were emergency c-sections.<sup>24</sup>

Few countries reached c-section rates as high as Brazil, where rates in private health facilities can exceed 80%.<sup>a</sup> These rates have become emblematic of medical interference with the female body and its dynamics.<sup>3,18</sup>

Maternal and neonatal morbidity/mortality rates are failing to decline as a result of excessive c-sections. Excessive c-sections are also associated with poor maternal and perinatal outcomes. A Brazilian study of three birth cohorts (1982, 1993, and 2004) from the city of Pelotas, Southern Brazil, showed that c-section rates increased in both public (from 23.6% to 34.1%) and private (49.4% to 82.4%) sectors, with a much higher proportion in the latter. Maternal characteristics have improved: women have become taller, better nourished and educated, smoke less, begin antenatal care earlier, and have more antenatal care appointments. However, the percentage of preterm deliveries increased (from 6.3% in 1982 to 16.2% in 2004) both among c-sections and vaginal births, leading to a mean reduction of 47 g in newborn weight. The increase in preterm vaginal births was associated with a 2.5% increase in inductions, which reached 43.0% in 2004, although these data may not be entirely reliable, given that they were self-reported by the mothers.<sup>5</sup>

Elective c-sections may result in iatrogenic preterm birth, prolong hospitalization, and have a negative effect on breastfeeding.<sup>b</sup> C-sections involve surgical and anesthesia-related risks, and may have long-term consequences on later pregnancies, including conditions of high hemorrhagic risk (such as placenta previa and placenta accreta), which may often lead to maternal death.<sup>a</sup> As an attempt to reduce these issues, efforts have been made to avoid primary or repeat c-sections. In the United States, the vaginal delivery rate among women with one prior c-section and who did a trial of labor remains around 74%.<sup>c</sup>

Strategies aimed at reducing c-section rates in Brazil, include the creation of Birth Centers (BC). Created in 1998 through Ministry of Health statute GM 985/99,<sup>d</sup> BCs are aimed at promoting vaginal birth outside the surgical environment. These facilities value the physiology of vaginal delivery, the presence of the

partner, and the immediate contact between mother and newborn. Vaginal delivery care is provided by nurse-midwives and midwives, and may take place in in-hospital, alongside or freestanding birth centers. Encouragement of vaginal delivery and delimitation of the interventions provided by physicians and nurses are among the foundations of the BC philosophy.<sup>2</sup> Nurse-midwives and midwives are legally entitled to provide care during physiological delivery in Brazil.<sup>e</sup> In the BC, physicians are usually only required for surgical delivery or in the case of complications.

Although there are a small number of studies<sup>7,14,16</sup> investigating the results obtained by BCs in Brazil, few of these address the use of c-sections within these centers. Thus, the aim of the present study was to estimate the prevalence of c-sections in a BC, and to identify its associated factors.

## METHODS

We carried out a cross-sectional study in an intra-hospital BC in the city of Sao Paulo, Southeastern Brazil. This BC provides care to pregnant women classified as of low-risk. Care for labor and vaginal delivery is provided by nurse-midwives and midwives. Any abnormalities in the physiological labor process or in fetal vitality are referred to obstetricians. Examples of such alterations include meconium-stained amniotic fluid, failure to progress, and deceleration of fetal heart rate, among others.

Our study population comprised all births taken place within the institution between March and April 2005, totaling 2,441 mothers and their newborns. The survey was conducted by manual review of pregnancy charts, from which data on mother, labor, delivery, and newborn were extracted and transcribed to our own forms. Missing data from pregnancy charts were defined as "losses." Variables in the study included maternal age, parity, gestational age, obstetric history, use of oxytocin, duration of labor, c-section indication (categorized as fetus-related, labor-related, and other), and birthweight.

The dependent variable (mode of delivery) was classified as vaginal or c-section, and independent variables were grouped into maternal age and current/prior obstetric history; delivery care; and perinatal outcomes.

<sup>a</sup> Agência Nacional de Saúde Suplementar. O modelo de atenção obstétrica no setor de saúde suplementar no Brasil: cenários e perspectivas. Brasília (DF): Ministério da Saúde; 2008 [cited 2010 Jun 23]. Available from: [http://bvsms.saude.gov.br/bvs/publicacoes/modelo\\_atencao\\_obstetrica.pdf](http://bvsms.saude.gov.br/bvs/publicacoes/modelo_atencao_obstetrica.pdf)

<sup>b</sup> NIH State-of-the-Science Conference Statement on Caesarean Delivery on Maternal Request. NIH Consens Sci Statements. 2006. Mar 27-29; 23(1) 1-29. [cited 2010 Jun 22]. Available from: <http://consensus.nih.gov/2006/cesareanstatement.pdf>

<sup>c</sup> NIH Consensus Development Conference Statement Vaginal Birth After Caesarean: new insights. NIH Consens Sci Statements. 2010. Mar 8-10; 27(3):1-48. [cited 2010 Jun 22]. Available from: <http://pnass.datasus.gov.br/documentos/normas/45.pdf>

<sup>d</sup> Ministério da Saúde. Portaria no 985/GM, de 5 de agosto de 1999. Cria o Centro de Parto Normal-CPN, no âmbito do Sistema Único de Saúde. Brasília (DF); 1999. [cited 2010 Jun 22]. Available from: <http://pnass.datasus.gov.br/documentos/normas/45.pdf>

<sup>e</sup> Ministério da Saúde. Portaria nº 163, de 22 de setembro de 1998. Reafirma as atribuições da enfermeira obstetra e da obstetriz e aprova modelo do laudo de Enfermagem para emissão da A.I.H. *Diário Oficial Uniao*. 24 set 1998; [cited 2010 Jun 22]. Available from: [http://sna.saude.gov.br/legisla/legisla/obst/SAS\\_P163\\_98obst.doc](http://sna.saude.gov.br/legisla/legisla/obst/SAS_P163_98obst.doc)

In order to measure the association between c-section and the other variables, we calculated prevalence ratios (PR) and their respective 95% confidence intervals (95%CI). In cross-sectional studies, measures of association are presented as odds ratios (OR) and PRs. In the literature, there is an intense discussion among epidemiologists as to which measure (OR or PR) is most appropriate to measure the effects of risk factors. When prevalence of the class of interest is high (greater than 10%, for instance), the OR overestimates the PR. Confusion arises when prevalence is interpreted as a PR. This approximation may be considered correct when prevalence of the studied class is low (as in the case of rare diseases).<sup>4</sup> In the present study, we use the delta method<sup>19</sup> to estimate confidence intervals for PRs.

The present study was approved by the Research Ethics Committee of the School of Nursing of the University of Sao Paulo (Process no. 527/2006).

## RESULTS

Of a total of 2,441 births taken place during the study period, 336 were by c-section, corresponding to 14.9% of all deliveries. Adolescent mothers accounted for

approximately 11% of the sample. C-sections were most prevalent among older women. History of prior c-sections and gestational age over 40 weeks were also associated with higher prevalence of c-sections (Table 1).

Oxytocin was administered to 41.4% of women. There was no significant association between use of oxytocin and prevalence of c-sections (Table 2).

Time of the day was associated with mode of delivery. Deliveries that took place between 7 p.m. and 11:59 p.m. were less likely to have been by c-section than those that took place during the day shift. Those taking place during early hours (midnight to 6:59 a.m.) were even less likely to be by c-section. Regarding the length of time between admission and delivery, intervals from 7 to 12 hours emerged as a protective factor against c-sections when compared to shorter periods. Almost one-quarter of women that delivered via c-section underwent surgery less than one hour after admission; most of these women had had repeated (two or more previous) c-sections.

Women admitted to the BC with no cervical dilation were more likely to undergo c-section when compared to women with 5-9 cm. Women with meconium-stained

**Table 1.** Prevalence of c-sections, prevalence rates, and 95% confidence intervals, according to demographic and obstetric variables. Sao Paulo, Southeastern Brazil, 2005. (n = 2.441)

Variable	Total	N°. of c-sections (%)	PR	95%CI	p*
Maternal age (years)					
< 20	660	72 (10.9)	0.67	0.53;0.86	0.0020
20-34	1,631	265 (16.3)	1		
≥ 35	149	29 (19.5)	1.20	0.85;1.69	
Data not available	1	-	-	-	
Parity					
Primipara	1,224	195 (15.9)	1		0.2260
Multipara	1,179	167 (14.2)	0.89	0.74;1.08	
Data not available	38		-		
Prior c-section					
No	2,120	254 (12.0)	1		0.0001
Yes	283	108 (38.2)	3.19	2.64;3.84	
Data not available	38				
Gestational age (weeks)					
≤ 40	1,639	221 (13.5)	1		0.0050
> 40	774	138 (17.8)	1.32	1.09;1.61	
Data not available	28				
Obstetric history					
Nullipara	1,313	206 (15.7)	1		0.0001
Vaginal	807	48 (5.9)	0.38	0.28;0.51	
C-section	197	90 (45.7)	2.91	2.39;3.55	
C-section + vaginal	86	18 (20.9)	1.33	0.87;2.05	
Data not available	38				

\* Chi-squared test

the amniotic fluid were also more likely to undergo c-sections compared to those with clear fluid. Birthweight was also associated with mode of delivery: babies born weighing under 2,500 g and over 3,500 g were more likely to have been delivered by c-section.

Women who delivered vaginally in their previous pregnancies showed lower prevalence of c-sections, even when their obstetric history included a prior c-section (PR 0.46, 95%CI 0.30;0.71,  $p = 0.0010$ ). Taking obstetric history into account, 283 women had a history of c-sections in their previously delivery. Of these, 175 (61.8%) delivered their current babies vaginally, while 108 (38.2%) did so by c-section.

In 206/366 women (56.3%), c-sections were primary, that is, were for the woman's first delivery. Fetal distress

emerged as the major indication for this procedure, followed by failure to progress through labor.

Among the indications for c-sections, we found that factors associated to the newborn, such as fetal distress, meconium-stained amniotic fluid (diagnosed by cardiotocography), macrosomia, and breech presentation accounted for 47.8% (175) of c-section indications. Labor-related conditions, such as failure to progress, functional dystocia, and shoulder dystocia accounted for 31.3% (115) of these indications (Table 3).

## DISCUSSION

In the present study, the rate of c-sections (14.9%) was within the 15% limit proposed by the World Health Organization (WHO) in 1985.<sup>25</sup> A number of authors

**Table 2.** Prevalence of c-sections, prevalence rates, and 95% confidence intervals, according to care-related variables and perinatal outcomes. Sao Paulo, Southeastern Brazil, 2005.

Variable	Total	N.º de cesarianas (%)	RP	IC95%	p <sup>a</sup>
Use of oxytocin					
No	1,419	223 (15.7)	1		0.0910
Yes	1,004	133 (13.3)	0.84	0.69;1.03	
Data not available	18				
Shift					
12:00 a.m. to 6:59 a.m.	770	83 (10.8)	0.59	0.46;0.74	0.0001
7:00 a.m. to 6:59 p.m.	1,179	217 (18.4)	1		
7:00 p.m. to 11:59 p.m.	492	66 (13.4)	0.73	0.62;0.86	
Duration of admission prior to delivery (hours)					
< 1	207	51 (24.6)	2.36	1.71;3.27	0.0001
1 to 6	1,120	163 (14.6)	1.4	1.07;1.82	
7 to 12	671	70 (10.4)	1		
> 13	441	82 (18.6)	1.78	1.33;2.39	
Data not available	2				
Cervical dilation (cm)					
None	65	54 (83.1)	15.87	11.39;22.13	0.0001
Up to 4	1,511	255 (16.9)	3.22	2.31;4.50	
5 to 9	707	37 (5.2)	1		
10	87	2 (2.3)	0.44	0.11;1.79	
Data not available	71				
Presence of meconium					
No	2,148	273 (12.7)	1		0.0001
Yes	289	92 (31.8)	2.5	2.05;3.06	
Data not available	4				
Birthweight (kg)					
< 2.5	77	15 (19.5)	1.3	0.81;2.09	0.0001
2.5 to 3	618	67 (10.8)	0.72	0.56;0.95	
3 to 3.5	1,143	171 (15.0)	1		
3.5 to 4	513	88 (17.2)	1.15	0.91;1.45	
> 4	90	25 (27.8)	1.86	1.29;2.66	

<sup>a</sup> Chi-square test

**Table 3.** Frequency of reasons for c-section indication. Sao Paulo, Southeastern Brazil, 2005.

C-section indications	n	%
Fetus-related		
Fetal distress	85	23.2
Breech presentation	30	8.2
Meconium	35	9.6
Macrosomia	25	6.8
Labor-related		
Failure to progress	59	16.1
Functional dystocia	51	13.9
Shoulder dystocia	5	1.3
Others		
Repeat (2 or more previous) c-sections	32	8.7
No indication	12	3.3
Cephalopelvic disproportion	10	2.7
Arterial hypertension	7	1.9
Placental abruption	5	1.3
One previous c-section	2	0.6
Oligohydramnios	2	0.6
Multiple births	2	0.6
Blood in amniotic fluid	1	0.3
Uterine tumor	1	0.3
Placenta previa	1	0.3
Umbilical cord prolapse	1	0.3
Total	366	100

have questioned this ideal rate, arguing that it is inconsistent and that ideal rates should reflect resource availability and women's preferences.<sup>8</sup> Notwithstanding, the rate found in the present study was lower than those observed in public hospitals (29.7%) and medium complexity hospitals (28.1%).<sup>20</sup>

Women aged 35 or older were 20% more likely to deliver by c-section than those aged 20-34 years (although this difference was not statistically significant). Women under 20 years of age were 33% less likely to undergo a c-section. Studies of the factors associated with c-sections in Brazilian hospitals found that women aged 35 years or older have twice the prevalence of c-sections than women aged under 20 years.<sup>20</sup>

Roughly 60% of women whose previous delivery had been by c-section delivered their current babies vaginally, and we observed no cases of uterine rupture. These results are in agreement with those of surveys that compare planned c-sections and planned vaginal birth among women with a history of c-sections.<sup>11,12</sup> Success rates for vaginal birth after c-section ranged from 64% to 85%, whereas prevalence of uterine rupture ranged from 0.16% to 2.1%.<sup>11</sup> In the review that compared planned induction with c-section for women with one prior c-section, prostaglandins and oxytocin were

reported as being used for labor induction, in spite of such use being contraindicated for women with uterine scars by the drug manufacturers.<sup>12</sup> Neither review was able to find randomized studies on the subject. Their results must therefore be interpreted with caution, given that risks and benefits may be overestimated by bias in the surveys reviewed.

A report by the United States National Institutes of Health concluded that rates of vaginal birth after c-section have decreased significantly since 1996,<sup>6</sup> in association with a number of obstetric and demographic factors. According to this study, African or Hispanic ascendance, being single, having less than 12 years of schooling, having a maternal disease, and being admitted at a rural or private hospital are among the factors associated with lower probability of delivering vaginally after a c-section.

In this sense, having had a prior c-section may, in conjunction with other factors, influence the decision to deliver vaginally in the current pregnancy. A study carried out in Greece analyzed c-section indications between 2002 and 2009. The predominant reason for indicating a c-section in this study was previous c-section (30.9%), followed by cardiocographic abnormalities (12.3%).<sup>10</sup> This was the only reason for indication that increased significantly during the studied period. Choudhury & Dawson<sup>8</sup> showed a similar trend in a study of a 7-year period in Wales. In this study, prior c-sections accounted for 20% of surgical delivery indications. In the present study, prior c-section was not a determinant factor for current c-section. However, based in our clinical experience, prior c-sections, when associated with other maternal characteristics, such as age greater than 35 years, suspected macrosomia or rupture of membranes, and unfavorable cervix may increase the probability of a c-section indication. We also found that prolonged pregnancies tend to be more strongly associated with induction of labor, use of oxytocin, presence of meconium, and c-section delivery.

Considering the possibility of vaginal delivery for women with prior c-sections may be a means to reduce the high rates of surgical delivery in Brazil.

It is difficult to analyze c-section indications in cases where this procedure is performed almost routinely. Thus, we sought studies from countries in which c-section indications are thought to be related more closely to medical than to economic reasons.

In Pakistan, a study comparing the clinical and epidemiological characteristics of women undergoing c-sections, either for the first time or after prior c-sections, found an overall rate of 13.6%, of which 70.1% were primary and 29.9% were repeat c-sections. Characteristics associated with primary c-sections were age under 20 years, early rupture of membranes, labor induction, and

birthweight > 3.500 g. Emergency procedures were predominant among primary c-sections.<sup>21</sup> In the present survey, mother's age was not associated with c-section indication; however, birthweight > 4 kg and presence of meconium were associated with this outcome.

In a study carried out in Singapore, the rate of c-sections increased from 16.8% in 1998 to 25.1% in 2001. Rates of primary and placenta previa-related c-sections showed the greatest increase.<sup>23</sup> A similar phenomenon is taking place in Greece. Primary c-sections, which, between 1977 and 1983 accounted for 6.1% of these surgeries, increased to 19% in the period from 1994 to 2000.<sup>22</sup> Despite this increase, these rates were still lower than those found in the present study. In Saudi-Arabia, the c-section rate in a medical facility was 18%. C-sections were mostly due to dystocia (more frequent among young women and primiparas) and to repeat c-sections (among multiparas). Fetal monitoring was implicated as a cause of inadequate c-section indication.<sup>9</sup> In the present study, the proportion of c-section indications due to dystocia was 15.2%. In another Brazilian survey, the c-section rate in a university hospital was 10.3%, with 6.1% of primary c-sections. Major reasons for c-section were breech presentation, failure to progress, and fetal distress.<sup>15</sup>

A multicenter study<sup>13</sup> involving four countries in Southeast Asia (Indonesia, Malaysia, Phillipines, and Thailand) analyzed the hospital delivery records of nine participating institutions. This study included 9,550 women and 9,665 newborns; c-section rates ranged from 19% to 35% between countries, and from 12% to 39% among hospitals within a same country. The major reason for c-section indication was prior c-section (7%); followed by cephalopelvic disproportion (6.3%) – more than twice the proportion found in the present study (2.7%); breech presentation (4.7%); and fetal distress (3.3%) – much lower than in the present study (23.2%). In the present study, history of prior c-section increased the probability of c-section in the current delivery by more than three fold.

C-sections are becoming more frequent in cases of breech presentation. Nonetheless, there are professionals who argue for its resolution by vaginal delivery. In the present study, all cases of breech presentation were resolved by c-section, accounting for 8.2% of the indications for this procedure. In a Saudi hospital, of 112 deliveries by first-time mothers with breech

presentation, 96 (857%) entered labor, and 67 (69.8%) delivered vaginally. Perinatal results did not differ between the two groups.<sup>1</sup> In Athens, Greece, the proportion of c-sections related to breech presentation increased from 16.9% in 1965 to 74.1% in 1995. In the same period, neonatal mortality decreased from 70.1% to 36.6%. Thus, a four-fold increase in c-sections reduced by half the perinatal mortality among fetuses with breech presentation.<sup>17</sup> On the other hand, a study carried out in a hospital in England investigated c-section indications in a 7-year period, showing that the percentage of c-sections due to breech presentation remained constant throughout the surveyed period, ranging from 10.4% in 2002 to 11.4% in 2007.<sup>8</sup>

The increase in the proportion of c-sections in WHO's Global Survey on Maternal and Perinatal Health was associated with a worsening of perinatal outcomes, including increases in preterm deliveries and admission to neonatal intensive care units.<sup>24</sup> The authors of this survey concluded that increased c-section rates were associated with greater use of antibiotics in the postpartum period and greater maternal and newborn morbidity and mortality, even after adjustment for demographic characteristics, risk factors, clinical complications of pregnancy, type and complexity of the institutions where babies were delivered, and percentage of transfers. There was increased risk of perinatal mortality at c-section rates between 10% and 20%. In hospitals with high c-section rates, the greater proportion of babies that remain in intensive care for seven days or more may be related to the respiratory distress syndrome associated with elective c-section.<sup>24</sup>

A limitation of the present study is that data are collected from secondary sources (patient charts) spanning a relatively short period, and which may have been influenced by other variables, such as absence of a protocol for c-section indication.

However, our results may provide input for improving c-section indication criteria. Careful monitoring of fetal conditions during labor, especially in pregnancies lasting longer than 40 weeks, may decrease the rate of c-sections.

Prevalence of c-sections in this in-hospital Birth Center was lower than the rates found in other maternity wards across the country, in both the public and private networks.

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