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# Factors associated with cesarean sections in Brazilian hospitals

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## ABSTRACT

**OBJECTIVE:** To assess the prevalence of cesarean sections in Brazilian hospitals.

**METHODS:** A cross-sectional study was carried out with data from the World Health Organization's Global Data System for Maternal and Perinatal Health, for the Brazilian states of São Paulo, Pernambuco and the Federal District. Data relating to 15,354 women who gave birth between September/2004 and March/2005 were analyzed, according to sociodemographic, reproductive, and hospital-related characteristics. Bivariate analyses – with calculations of the prevalence ratios and respective confidence intervals – and multivariate Poisson regression analyses were performed.

**RESULTS:** The prevalence ratio of cesarean sections was significantly higher among older women, who were married/living with a partner and with higher body mass index. The following conditions during pregnancy or birth were associated with higher cesarean section prevalence ratio: parturient being diagnosed as HIV-positive, heavier weight and greater head circumference of the newborn, and more prenatal consultations. In regression analysis, the following variables showed direct association with the outcome: parturient being older and with higher schooling level, presence of hypertension/eclampsia, chronic condition or some other medical condition, newborn's greater head circumference, being primiparous, having had a cesarean in the last pregnancy and having received an epidural block or rachidian analgesic during labor. Although the proportion of cesareans was higher in hospitals with a high complexity index, the difference was not statistically significant, as well as for other characteristics of hospitals.

**CONCLUSIONS:** The conditions of the pregnancy, newborn and the sociodemographic and reproductive characteristics of the parturient were independently associated with cesarean delivery. The hospital complexity index was not associated with cesarean delivery, probably due to the homogeneity of the hospital sample.

**DESCRIPTORS:** Cesarean Section, statistics & numerical data. Risk Factors. Socioeconomic Factors. Maternal Health Services. Cross-Sectional Studies.

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## INTRODUCTION

The cesarean section operation is of benefit to pregnant women and newborns when its indication is well-founded. However, its use has increased since the 1970s to levels that are medically unjustifiable, thus bringing negative, economic and health-related repercussions.<sup>3,7,9,19</sup>

An analysis of births in Brazil in 2004 shows that in most states the number of cesarean births represents 41.8% of the overall number of births.<sup>a</sup> This increase is higher in private hospitals than in public ones.<sup>3</sup> According to the National Agency of Supplementary Health of the Ministry of Health (ANS), in 2004, cesareans represented 79.7% of the births in the supplementary health sector, while in the National Health System (SUS) this percentage was 27.5%.<sup>b</sup>

These high rates of cesarean section are of concern because the indiscriminate use of this procedure may put the health of mothers and newborns at risk.<sup>7,12,19</sup> Consequently, international organizations, like the World Health Organization (WHO), the Ministry of Health and researchers have proposed strategies for reducing these rates in Brazil, such as requiring a second opinion in the case of a medical indication for a cesarean section.<sup>1</sup> Moreover, the incidence of this type of birth has been monitored by the Ministry of Health.<sup>c</sup>

To assess the relation between the type of birth and maternal and perinatal outcomes the WHO created a global data system.<sup>16</sup> This system contains data on the births that occurred between September 1<sup>st</sup>, 2004 and March 30<sup>th</sup>, 2005 in randomly selected hospitals in various countries, including Brazil.<sup>16,19</sup> The resulting database is a relevant source of information about the situation of cesarean section births in Brazil. Its aim is to contribute for the development of interventions for reducing the number of unnecessarily performed cesareans.

The objective of this study was to assess the prevalence of cesarean sections in Brazilian hospitals.

## METHODS

To constitute the WHO Global Data System on Maternal and Perinatal Health<sup>16</sup> a three-stage, cross-sectional cluster sampling study was carried out to obtain a representative sample. First, 54 countries were randomly selected, four in each of the 14 sub-regions, as defined by the WHO. These constituted the first sample level. The second stage involved selecting the capital and two provinces/states for each country. The third

stage was the random selection of up to seven health institutions, either public or private, where deliveries at least 1,000 had occurred in the year prior to the study. In this article the results of a secondary analysis of data from the Global System are presented, for which only data from Brazil were used.

In Brazil, data collection in hospitals with more than 6,000 births/year in 2003 lasted two months and three months in those with fewer births. The study also included 15,379 women who had given birth between September 2004 and March 2005, and their newborns, in 19 hospitals in the states of São Paulo (seven), Pernambuco (five) and the Federal District (seven). Women who had miscarried and those where the birth had taken place outside the selected hospitals were excluded. The medical records of all the women who had given birth in the specified period were reviewed and analyzed.

The characteristics of the hospitals were obtained using a form completed by the doctor of the clinical team responsible for collecting the data in each of them. The hospitals were classified according to their source of care funding, as referred to in the National Register of Health Establishments: care paid for exclusively by the SUS or by the SUS and another source. The data obtained from the women's medical records were registered on a specific form and subsequently input into the WHO's online database.

None of the hospitals that took part in the study were fully private, i.e. they also attended SUS and supplementary health plan patients. The majority of patients were SUS users. Only 16% of the women included in the study were not assisted in hospitals exclusively covered by the SUS.

A hospital complexity index was devised, according to the capacity of the hospitals to provide care at different levels. This index used a set of eight categories, which were classified into essential or optional services/resources: building/structure, general medical/laboratory care, anesthesiology, screening test, human resources, basic obstetric services, intrapartum care and ongoing medical education. Categories were scored according to the presence of the following services and resources: availability of all essential and optional resources and services (high level, two points); all essential and some optional items (medium level, one point), and lack of any of the essential items (low level, no points). The complexity score of the hospital varied

<sup>a</sup> Ministério da Saúde. Secretaria de Vigilância em Saúde. Uma análise dos nascimentos no Brasil e Regiões. 2004. [cited 2006 Aug 09]. Available from: [http://portal.saude.gov.br/portal/svs/visualizar\\_texto.cfm?idtxt=24455](http://portal.saude.gov.br/portal/svs/visualizar_texto.cfm?idtxt=24455)

<sup>b</sup> Agência Nacional de Saúde Suplementar. Brasil tem uma das maiores taxas de cesariana na Saúde Suplementar. 2006 [cited 2006 Mar 20]. Available from: [http://www.ans.gov.br/portal/site/home2/destaque\\_22585\\_2.asp](http://www.ans.gov.br/portal/site/home2/destaque_22585_2.asp)

<sup>c</sup> Ministério da Saúde. Secretaria de Vigilância em Saúde. Uma análise dos nascimentos no Brasil e Regiões. 2004. [cited 2006 Aug 09]. Available from: [http://portal.saude.gov.br/portal/svs/visualizar\\_texto.cfm?idtxt=24455](http://portal.saude.gov.br/portal/svs/visualizar_texto.cfm?idtxt=24455)

from 0 to 16 points and the cut-off points were defined by terciles: low complexity:  $\leq 9$ ; medium complexity: 10-12; high complexity:  $\geq 13$ . None of the hospitals was classified as low complexity, 14 of them were high complexity and five were medium complexity.

The conditions present during the pregnancy or birth, obtained from the women's medical records, were defined and categorized as: pre-labor rupture of membranes; hypertension-eclampsia (pregnancy-induced hypertension, chronic hypertension, pre-eclampsia and eclampsia); chronic medical conditions (cardiac/renal diseases, chronic respiratory conditions and diabetes mellitus); low uterus for the gestational age; anemia (falciform cell anemia and severe anemia -  $Hb < 7g/l$ ); vaginal bleeding in the second half of the pregnancy; pyelonephritis or urinary tract infection; sexually transmitted infections (STIs – any disease with genital ulcers, condyloma acuminatum), AIDS (any condition that suggests HIV/AIDS); and other medical conditions.

SPSS v.17.0 and Stata v.7.0. were used for analyzing the data. Twenty five cases for which there was no information about the type of birth were excluded; thus totaling 15,354 medical records analyzed.

In the bivariate analysis, the frequencies, prevalence ratios (PR) of cesarean births and the respective confidence intervals of 95% were calculated. Simple Poisson regression models with robust variance were developed for this analysis. In the end, two multiple Poisson regression models with robust variance and backward selection criterion were produced.<sup>2</sup> The federation unit was considered as being the primary sampling unit. This complex sampling plane characteristic was considered in both analyses.

For the multiple analysis the outcome of the pregnancy was considered as the dependent variable, with predictor variables:

- maternal characteristics: marital status, age, education, number of pregnancies, number of previous births, number of pre-natal consultations;
- characteristics of the hospital: complexity index, funding for the care provided, number of midwives in the hospital, students (nursing/midwifery and medical students involved in the delivery);
- characteristics of the newborn: weight, cephalic perimeter;
- conditions during pregnancy or at the birth: HIV diagnosis (positive or negative), pre-labor rupture of membranes, hypertension/eclampsia, chronic conditions, low uterus for gestational age, anemia, vaginal bleeding in the second half of the pregnancy, pyelonephritis or urinary tract infection, STI, AIDS and other medical conditions.

All women were included in the first Poisson multiple regression model, while in the second only multiparous women were. Body mass index was not included as a predictor variable in either of the models, due to the large amount of missing information relating to the weight and height of the women. In the first model, the outcome of the previous pregnancy and cesarean section in the last pregnancy were also not included as predictor variables since they only applied to multiparous women.

In the second model, the categories of the predictor variable number of pregnancies and number of previous births were redefined. The outcomes of the previous pregnancy and cesarean section in the last pregnancy were also added to the model as predictor variables.

The study was approved by the Research Commission of the *Centro de Atenção Integral à Saúde da Mulher* (CAISM) and by the Research Ethics Committee of the *Faculdade de Ciências Médicas* of the *Universidade Estadual de Campinas* (register CEP 113/2007).

## RESULTS

The percentage of cesarean sections was 30.1%. The prevalence of cesarean sections was higher in hospitals with a high complexity index (35.4%) than in medium complexity hospitals (28.1%), although the difference was not statistically significant. In hospitals in which there were no midwives to attend to the birth, a third of the births were cesarean sections. In those where there were one or more midwives, less than a quarter of the births were cesareans. There was a greater proportion of cesareans in those hospitals where there were only medical students (39.2%) and a smaller proportion in those where there were only nursing/midwifery students (26.7%). The proportion of cesarean sections was slightly greater in hospitals with mixed funding (32.0%) than in those exclusively funded by the SUS (29.7%). However, the differences between the PRs were not statistically significant (Table 1).

The older the woman, the higher the rate of cesarean section; the PR among women aged 35 and over was two times higher than that of women under 20. The percentage of cesarean sections among women who had more than eight years of education was greater than among those with fewer years of education, but the PR was not statistically significant. The prevalence among married women or those in a stable relationship was 7 percentage points higher than among those who were not in a relationship. The greater the body mass index (BMI), the greater the proportion of cesareans: women with  $BMI \geq 30$  had a PR almost 80% higher than those with BMI below 25 (Table 2).

Previous pregnancy resulting in cesarean represented a PR almost five times higher than for women whose

**Table 1.** Prevalence and prevalence ratio of cesarean sections, according to characteristics of the hospitals selected. Federal District, states of São Paulo and Pernambuco, 2004-2005. (N=15,354)

Variable	%	n	PR	95% CI	p
Hospital complexity index					0,101
Medium	28.1	11228	1		
High	35.4	4126	1.26	0.90;1.76	
Funding for care provided					0.685
Public	29.7	12832	1		
Public/ private/ health plan	32.0	2522	1.08	0.54;2.16	
Number of midwives involved in birth					0.289
None	33.3	9995	1.38	0.53;3.60	
≥ 1	24.2	5359	1		
Students involved in birth					
Exclusively nursing/midwifery students	26.7	3594	1		0.906
None	28.1	7225	1.05	0.19;5.78	0.906
Both students	32.1	2082	1.21	0.23;6.34	0.676
Exclusively medical students	39.2	2453	1.47	0.19;11.28	0.500

previous pregnancy had resulted in vaginal birth. The cesarean PR among women who had received rachidian anesthesia was almost three times higher than among those who had received no analgesic; among those who received epidural block the PR was 1.65. On the other hand, among women who had received an injectable analgesic and an alternative method the cesarean PR was lower than among those who received no analgesic: 0.13 and 0.36, respectively. These differences were statistically significant. The number of pregnancies, including the current one, the number or previous births and the outcome of the previous pregnancy were not associated with the type of birth (Table 3).

Among the conditions presented during the current pregnancy or birth, hypertension-eclampsia, chronic conditions, low uterus for gestational age, sexually transmitted infections and other medical conditions were associated with a greater proportion of cesarean sections. No association between the type of birth and other conditions studied was observed (Table 4).

The cesarean PR in parturient women diagnosed as being HIV positive was almost twice that observed in those who were not HIV positive. The PR was also higher when the newborn was heavier and had a greater cephalic perimeter and when the women had attended more than six prenatal consultations. All these differences were statistically significant (Table 4).

In the first Poisson regression model, with nulliparous women and multiparous mothers, the bivariate analysis associations between performing a cesarean section and

older age, hypertension/eclampsia and chronic medical conditions in pregnancy, other medical conditions, having a rachidian or epidural block analgesic and the cephalic perimeter of the newborn being equal to or greater than 35 cm were all confirmed. Furthermore, having more than eight years of education (PR = 1.16) and not having given birth previously (PR = 1.13) were associated regardless of the cesarean section. In the second model, the associations between cesarean sections and hypertension/eclampsia, other medical conditions, having a rachidian or epidural block analgesic, previous pregnancy having resulted in cesarean section and cephalic perimeter of the newborn being equal to or greater than 35 cm were only confirmed for multiparous mothers (Table 5).

## DISCUSSION

The 30% prevalence of cesarean births in the sample analyzed is lower than national data in this same year (41.8%),<sup>a</sup> suggesting that the hospitals studied are not representative of Brazil as a whole. Even so, the rates are higher than those recommended by the WHO and the Ministry of Health. Therefore, the 29.7% cesarean sections performed in hospitals that only receive SUS care funding and that were observed in our sample, is close to the 27.5% for the public sector in 2004, but far from the 79.7% seen in the private sector in another study.<sup>b</sup> The omission of totally private hospitals was unintentional, but resulted from the hospital inclusion criterion (at least 1,000 deliveries performed at the hospital

<sup>a</sup> Ministério da Saúde. Secretaria de Vigilância em Saúde. Uma análise dos nascimentos no Brasil e Regiões. 2004. [cited 2006 Aug 09]. Available from: [http://portal.saude.gov.br/portal/svs/visualizar\\_texto.cfm?idtxt=24455](http://portal.saude.gov.br/portal/svs/visualizar_texto.cfm?idtxt=24455)

<sup>b</sup> Agência Nacional de Saúde Suplementar. Brasil tem uma das maiores taxas de cesariana na Saúde Suplementar. 2006. [cited 2006 Mar 20]. Available from: [http://www.ans.gov.br/portal/site/home2/destaque\\_22585\\_2.asp](http://www.ans.gov.br/portal/site/home2/destaque_22585_2.asp)

**Table 2.** Prevalence and prevalence ratio of cesarean sections, according to sociodemographic characteristics of the parturient women in selected hospitals. Federal District, states of São Paulo and Pernambuco, 2004-2005. (N=15,354)

Variable	%	n	PR	95% CI	p
Age (years) (n=15,336)					
≤ 19	21.3	3387	1		
20 - 24	27.0	5061	1.26	1.10;1.45	0.019
25 - 29	32.9	3567	1.54	1.06;2.23	0.038
30 - 34	38.8	2093	1.82	1.13;2.92	0.032
≥ 35	43.7	1228	2.05	1.10;3.83	0.039
Education (years) (n=13,456)					
≤ 8	28.6	8114	1		0.196
> 8	32.8	5322	1.15	0.84;1.57	
Marital status (n=15,098)					
Single/widow	27.4	9272	1		0.017
Married/stable relationship	34.3	5826	1.25	1.10;1.42	
Body mass index (n=5,049)					
< 25	25.0	1533	1		
25 - 29	32.2	2345	1.29	1.10;1.52	0.021
≥ 30	45.6	1171	1.83	1.45;2.30	0.008

in the year prior to the study). So, the results presented refer only to the profile of cesarean births performed in selected hospitals from the Federal District and the states of São Paulo and Pernambuco that prioritize public care; the results cannot therefore be generalized.

The higher percentage of cesarean sections as the age of the woman increases may be related both to the higher frequency of complications, like hypertension and other chronic conditions, as well as to the increase in the percentage of those who no longer wish to have children and ask for tubal ligation. Although the Family Planning Law is fairly restrictive as to performing sterilization during a cesarean birth, studies indicate that this practice has not been abandoned, mainly when the woman has already had a previous cesarean operation.<sup>6,15</sup>

The association between education and the occurrence of cesareans, seen in the multiple analysis, confirms what has already been indicated in other studies.<sup>4,13</sup> If the sample were less homogenous, with a greater proportion of women who have university education, thus allowing for a separate analysis, the difference might be even greater. The relationship observed in the bivariate analysis between cesarean sections and marital status may be due to the relation between marital status and age.

Another aspect that should be discussed is the association between BMI and performing a cesarean section in the bivariate analysis. This was not tested in the multiple analysis because of a study limitation, since there was no information about the weight and height of the pregnant women for about two thirds of the sample. This made it impossible to include this variable

in the multiple analysis and also indicates a deficiency in the recording of relevant information in the medical records. However, studies show that BMI is strongly associated with hypertension and eclampsia, which are among the most important factors associated with cesarean births.<sup>10,14</sup>

The association between cesarean section both in the previous birth and the current pregnancy reaffirms what has been observed in other studies in which an iterative cesarean has been one of the most frequent primary obstetric indications. Fabri et al<sup>8</sup> (2002) concluded that the iterative cesarean was the main indication of cesarean sections in a teaching hospital (27%) as well as in another establishment (36%) in Uberlândia (Southeastern Brazil). Another study, carried out in the State of São Paulo, described that 95% of 234 women with two or more children and whose first delivery had been by cesarean section also underwent the same experience in their second delivery.<sup>13</sup> On the other hand, the bivariate analysis indicated no association between the number of previous births and cesareans, but the multiple analysis did, when all the women were considered in the analysis. As this was not duplicated in the model in which only multiparous mothers were included, it is possible that it is related to the fact that labor takes longer in primiparous women. Such results have been confirmed in several studies.<sup>5,10,18</sup>

Traditionally, the lack of analgesic in labor has been indicated as one of the variables associated with a higher incidence of cesarean births in Brazil.<sup>9</sup> However, we observed the highest cesarean PRs among women who received an epidural block or rachidian anesthetic



**Table 3.** Prevalence and prevalence ratio of cesarean sections, according to reproductive characteristics of parturient women in selected hospitals. Federal District, states of São Paulo and Pernambuco, 2004-2005. (N=15,354)

Variable	%	n	PR	95% CI	p
Number of pregnancies, including the current one (n=15,330)					0.911
1	30.2	6107	1.01	0.83;1.21	
≥ 2	30.0	9223	1		
Number of previous births (n=15,319)					0.747
None	30.3	6664	1.02	0.84;1.23	
≥ 1	29.9	8655	1		
Outcome of the previous pregnancy (n=8,619)					0.314
Live born	30.0	7344	1		
Miscarriage, death of newborn and born dead	31.5	1275	1.05	0.91;1.21	
Cesarean in previous pregnancy (n=8,884)					<0.002
No	17.3	7019	1		
Yes	78.4	1865	4.52	3.57;5.74	
Anesthesia/analgesic during labor (n=15,302)					
No analgesic	30.5	10464	1		
Epidural block	50.3	529	1.65	1.53;1.78	<0.002
Rachidian	89.6	963	2.94	2.64;3.27	<0.002
Injectable analgesic	4.1	1398	0.13	0.03;0.68	0.034
Alternative method	11.1	1948	0.36	0.30;0.44	0.002

when they were in labor. It is possible that the women who received this type of analgesic were precisely nulliparous women or those with some type of functional dystocia, with higher risk of having a cesarean. To define the effect of analgesic on the cesarean rate, a randomized clinical trial would be necessary, but it would not be ethically acceptable to determine who would not receive the analgesic.

Although being HIV seropositive was strongly associated with cesarean birth in the bivariate analysis, the percentage in this group was around 56%. This might reflow good clinical conditions and the wish of women to have a vaginal birth, or the lack of adequate follow-up in accordance with Ministry of Health recommendations. The recommendation of the Public Health Service Task Force of the United States (2009)<sup>a</sup> and of the Brazilian Ministry of Health<sup>b</sup> is that women with a viral load > 1000 copies/ml or unknown quantity should be submitted to elective cesarean in order to reduce the perinatal transmission of HIV. However, in our literature review, we found no data about how frequently information on the viral load is known at the time of labor in the health services in Brazil that would allow us to evaluate if the proportion of cesareans observed in this study is appropriate or not.

The strong association of hypertension/eclampsia and other chronic medical conditions with the percentage of cesareans is not surprising, since it is a well-known fact.<sup>11,14,17</sup> Despite their strong association with age, these medical conditions maintained their statistical significance in the multiple analysis by regression, indicating that they act independently on the cesarean rate. It was expected that the two fetal size indicators would be associated with the percentage of cesarean sections, regardless of other variables. But only cranial circumference maintained its association in the multiple analysis, suggesting that it might have a more significant influence on the type of birth than the weight of the newborn.

The association between a greater number of prenatal consultations and a greater percentage of cesarean births might seem paradoxical at first, but pregnant women suffering from conditions that indicate a predisposition to cesareans, like hypertension and others, consult their doctors more often. Therefore, it is the health problems of pregnant women that cause the greater number of consultations and determine more frequent cesarean sections. This was confirmed by the absence of an association of this variable with the PR of cesareans in the regression analysis.

<sup>a</sup> Public Health Service Task Force. Recommendation for use of antiretroviral drugs in pregnant HIV-1 infected women for maternal health and interventions to reduce perinatal HIV-1 transmission in the United States. [cited 2009 Nov 27]. Available from: <http://AIDSinfo.nih.gov/contentfiles/PerinatalG1.pdf>

<sup>b</sup> Ministério da Saúde. Secretaria de Vigilância em Saúde. Programa Nacional de DST e AIDS. Recomendações para profilaxia da transmissão vertical do HIV e terapia anti-retroviral em gestantes. Brasília, DF; 2006. (Manuais, 46).

**Table 4.** Prevalence and prevalence ratio of cesarean sections, according to characteristics of the current pregnancy of the parturient women and newborns in selected hospitals. Federal District, states of São Paulo and Pernambuco, 2004-2005. (N=15,354)

Variable	%	n	PR	95% CI	p
HIV diagnosis (n=15,296)					0.043
No	30.0	15227	1		
Yes	56.5	69	1.88	1.05;3.37	
Conditions during pregnancy or birth					
Pre-labor rupture of membranes (n=15,329)					0.816
Yes	29.4	2199	1		
No	30.2	13130	1.03	0.66;1.60	
Hypertension-eclampsia (n=15,323)					0.005
No	26.2	13395	1		
Yes	57.6	1928	2.20	1.75;2.78	
Chronic conditions (n=15,325)					0.006
No	29.6	14999	1		
Yes	52.8	326	1.78	1.46;2.18	
Low uterus for gestational age (n=15,193)					0.015
No	30.0	15068	1		
Yes	48.0	125	1.60	1.24;2.06	
Anemia (n=15,319)					0.064
No	30.0	15237	1		
Yes	47.6	82	1.58	0.94;2.68	
Vaginal bleeding in 2 <sup>nd</sup> half of the pregnancy (n=15,280)					0.365
No	30.0	15082	1		
Yes	36.9	198	1.23	0.57;2.63	
Pyelonephritis or urinary tract infection (n=15,279)					0.222
No	29.8	13765	1		
Yes	32.6	1514	1.09	0.88;1.36	
Sexually transmitted infection (n=15,314)					0.016
No	30.1	15220	1		
Yes	39.4	94	1.31	1.13;1.52	
AIDS (n=15,325)					0.214
No	30.1	15267	1		
Yes	43.1	58	1.43	0.61;3.39	
Other medical conditions (n=15,310)					0.016
No	28.8	14404	1		
Yes	50.9	906	1.77	1.29;2.41	
Birth weight of newborn (g) (n=15,298)					0.012
< 3500	28.3	11830	1		
≥ 3500	36.3	3468	1.28	1.14;1.45	
Cephalic perimeter of newborn (cm) (n=14,384)					0.007
< 35	25.1	9122	1		
≥ 35	38.6	5262	1.54	1.32;1.79	
Number of prenatal consultations (n=14,252)					0.024
≤ 6	27.5	8464	1		
> 6	34.0	5788	1.24	1.07;1.42	

**Table 5.** Multiple analysis by Poisson regression of variables associated with cesarean births in selected hospitals. Federal District, states of São Paulo and Pernambuco, 2004-2005. (N=15,354)

Model/Variable	PR	95% CI	p
<b>Model 1<sup>a</sup></b>			
Medical pathological conditions of the pregnancy			
Hypertension/eclampsia	1.97	1.84;2.11	<0.002
Other medical conditions	1.83	1.54;2.17	0.004
Chronic conditions	1.44	1.01;2.06	0.048
Characteristics of birth care			
Anesthesia during labor (epidural block or rachidian)	2.75	1.89;4.00	0.007
Characteristics of the parturient woman			
Age (years)	1.03	1.01;1.05	0.025
Education (>8 years)	1.16	1.05;1.27	0.023
Reproductive characteristics of the parturient woman			
Number of previous births (none)	1.13	1.01;1.27	0.044
Characteristics of the newborn			
Current cephalic perimeter of the newborn ( $\geq 35$ cm)	1.47	1.26;1.71	0.008
<b>Model 2<sup>b</sup></b>			
Medical pathological conditions of the pregnancy			
Hypertension/eclampsia	1.65	1.58;1.72	<0.001
Other medical conditions	1.55	1.32;1.83	0.008
Characteristics of birth care			
Anesthesia during labor (epidural block or rachidian)	2.11	1.62;2.75	0.007
Reproductive characteristics of the parturient woman			
Cesarean in the last pregnancy	3.95	3.32;4.702	<0.002
Characteristics of the newborn			
Current cephalic perimeter of the newborn ( $\geq 35$ cm)	1.26	1.02;1.57	0.044

<sup>a</sup> Includes nulliparous women and multiparous mothers (n=11,958). Does not include the variables: body mass index, final outcome of the previous pregnancy and cesarean section in the last pregnancy;

<sup>b</sup> Only multiparous mothers (n=6,155). Does not include the variable, body mass index.

The variables strongly associated with a greater probability of having a cesarean in the multiple analysis were related to the pathological conditions of the pregnancy, characteristics of labor care and the newborn, and sociodemographic and reproductive characteristics of the parturient woman. There were no associations with hospital characteristics in either the bivariate or multiple analyses, probably due to the homogeneity of the hospital sample.

There is still the need of studies including a larger number of births with private or health plan payment

in order to evaluate more accurately those factors associated with the high percentage of cesarean births in population groups that are economically better placed and in which there is a higher prevalence of cesarean births in Brazil. The ANS works with health plan operators and recommends they inform their users of the benefits of normal births and the risks of cesarean section when there is no precise indication for such.<sup>4,a</sup> In the near future, this type of action may facilitate research that includes the population covered by medical plans and even those women who only have private health care.



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