DOI: 10.1590/1980-5497201600030005

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Association between institutional factors, birth care profile, and cesarean section rates in Santa Catarina

Associação entre fatores institucionais, perfil da assistência ao parto e as taxas de cesariana em Santa Catarina

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ABSTRACT: ***Objectives:*** To investigate how institutional factors, represented by the social profile of childbirth care, can relate to cesarean section rates. ***Methods:*** A cross-sectional study based on data from *Sistema de Informações sobre Nascidos Vivos* (SINASC) for the state of Santa Catarina collected information for each of the six municipalities with the largest number of births from the six macroregional areas. For those municipalities, all of the establishments that had obstetric facilities were considered. A total of 61.278 births took place over 61 selected maternity services. Cesarean prevalence ratios (PR), both crude and adjusted for confounders, were estimated for each one of the individual variables using robust Cox regression. ***Results:*** Cesarean births were almost as twice as high in private maternity facilities (89%) when compared to the public ones (45.1%). Giving birth in private hospitals increased by at least 50% the prevalence of caesarean section among primiparae (PR = 1.64), Caucasian (PR = 1.57), women with greater attendance to prenatal care (PR = 1.54), and women having daylight birth (PR = 1.5), when compared with those delivering inside the public sector. ***Conclusion:*** Differences in cesarean rates in favor of the private system, among women with better social conditions, amongst which it would be expected a lower obstetric risk, have pointed toward differences in obstetric/medical culture permeability and flexibility on medical judgment concerning clinical criteria for cesarean sections.

Keywords: Cesarean section. Risk factors. Social inequity. Maternal health. Prospective payment system. Information services.

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Conflict of interests: nothing to declare – **Financial support:** none.

RESUMO: ***Objetivo:*** Investigar como fatores institucionais, representados pelo perfil social da maternidade na assistência ao parto, se associam às taxas de cesariana. ***Métodos:*** Estudo com delineamento transversal com base em dados do Sistema de Informações sobre Nascidos Vivos (SINASC) para Santa Catarina. Foram selecionados, para cada uma das macrorregionais, os seis municípios com o maior número de partos. Para esses municípios, foram considerados todos os estabelecimentos que possuíam leitos obstétricos. Um total de 61.278 partos teve lugar nas 61 maternidades selecionadas. Razões de prevalência de cesariana (RP), brutas e ajustadas para confundimento, foram estimadas para cada uma das variáveis individuais por meio de Regressão de Cox Robusta. ***Resultados:*** Nascimentos por cesariana foram quase o dobro nas maternidades privadas (89%), quando comparados aos do Sistema Único de Saúde (SUS) (45,1%). Ter parto nas maternidades privadas aumentou em pelo menos 50% a ocorrência de cesariana entre as primíparas (RP = 1,64), caucasianas (RP = 1,57), mulheres com maior frequência ao pré-natal (RP = 1,54) e tendo parto diurno (RP = 1,51), quando comparadas àquelas tendo parto pelo SUS. ***Conclusão:*** Diferenças nas taxas de cesariana em favor do sistema privado, entre mulheres de melhores condições sociais, em meio às quais seria esperado menor risco obstétrico, apontaram para diferenças de permeabilidade da cultura médica/obstétrica e flexibilização na interpretação médica das indicações clínicas do parto operatório.

Palavras-chave: Cesárea. Fatores de risco. Iniquidade social. Saúde materna. Sistema de pagamento prospectivo. Serviços de informação.

INTRODUCTION

Although cesarean section has recognized value when the health of mothers and newborns are at risk, its increasing use has been associated with increased maternal and perinatal morbidity and mortality, especially in the absence of medical indications[1,2].

In recent decades, there has been a progressive increase in the number of caesarean sections in Brazil[3] and in almost all countries[4]. A cesarean rate of 58.9% in 2011 for the state of Santa Catarina[5] are more than three times above the accepted by the World Health Organization (WHO), who warns that lower perinatal mortality rates are consistent with a cesarean rate below 15%[6].

Different studies have indicated social inequalities concerning cesarean section in Brazil with higher prevalence among women who are assisted in the private sector, among those with higher educational levels, with white skin color[7,8], and in regions with better access to health services[7-11]. High cesarean section rates and the social inequality indicate the paradox that women with low socioeconomic status and, consequently, increased risk of complications in childbirth, have less access to cesarean section than those exposed to lower risks and with higher income[2].

In a study conducted in São Paulo, approximately 43.0% of pregnant women of middle class who were cared for in a private clinic said they preferred the cesarean section because they were strongly influenced by the occurrence of a previous cesarean section. In contrast, women with previous vaginal delivery history showed much lower chance of choosing a cesarean section[12].

The physician's role as a key element in establishing an interventionist obstetric culture has been investigated in several studies[13-15]. The results of these studies show that both in public and in private sectors, more than half of the women who underwent cesarean section expressed preference for vaginal delivery[13].

Results of a recent study with patients assisted in the public sector — *Sistema Único de Saúde* (SUS) — that showed higher cesarean rates among women with higher educational levels, suggested the convenience for the medical agendas[14]. Similarly, it has been suggested that a frequently used strategy in the public sector, among pregnant women with higher purchasing power, is "to negotiate" the cesarean section as part of a prenatal appointment in the private sector[13]. In this context, the prenatal care, which also handles fears and fantasies, has been postulated as essential to stimulate the change of attitude toward labor[15].

It has been shown that the method of compensation, by itself, is not a determining factor for the high prevalence of cesarean section in our midst, and that other variables have significant influence[15]. In this context, several studies suggested that the increased effect of the private sector in the decisions regarding the type of delivery, represented by the flexibility concerning the obstetric method in the indications of cesarean sections for reasons not strictly medical, may be behind this phenomenon[4,7,15].

This study aimed at investigating factors associated with cesarean section occurrence when comparing public and private hospitals, with the assumption that any differences when comparing the different sectors, according to sociodemographic and reproductive factors, may be indicative of no strictly medical decisions.

METHODS

This is a cross-sectional study based on secondary data, in which information regarding pregnancies and childbirths events for live births in the state of Santa Catarina in 2012 were obtained from the database *Sistema de Informações sobre Nascidos Vivos* (SINASC), which is provided by the Ministry of Health[16]. Out-of-hospital births were excluded because they do not represent a risk of caesarean section, and multiple births were also not included because they constitute indication for cesarean section. The six municipalities with the highest number of births were selected in each of the nine macroregions of the State. For each of these cities, all establishments that had obstetric beds/maternity were considered.

Information about the profile of each of the studied hospitals were obtained through the Internet, in the National Register of Health Facilities (CNES)[17]. A total of 61 hospitals were included in the study. Hospitals were classified into three groups: public, private, and mixed public/private. This classification was based on calculation of the "ratio of public and private deliveries" obtained by dividing the number of public and private beds, using the information provided by the CNES. Thus, maternities were classified as public if 100% of beds were public and as private if 100% of beds were private. In contrast,

hospitals classified as mixed public/private were those that combined different proportions of public and private beds.

Individual variables obtained from SINASC/SC were maternal age, maternal educational level, marital status, ethnicity/color of skin, duration of pregnancy, number of prenatal visits, time of birth, parity, history of stillbirth in previous births, previous cesarean section, and type of delivery. Prevalence ratios (PR) of cesarean section, both crude and adjusted for confounders, were estimated for each of the individual variables using robust Cox regression[18].

Multivariate models were examined as a whole and according to the institutional profile (public/private). As criteria for the input of the variables in the multivariate model, we considered all variables with p-value equal or lower than 0.20 in the bivariate analysis.

HIERARCHICAL MODEL OF MULTIVARIATE ANALYSIS

The association of independent variables with the outcome was analyzed according to a hierarchical model for data entry, as suggested by different authors, as an alternative to the stepwise method (step by step)[19-21].

Classic strategies applied to the analysis of association of multiple factors with the outcome, for example, the stepwise regression, consider all factors with the same level of importance, making no distinction between confounders and mediating factors[19]. Differently, in the hierarchical regression model, the underlying principle is that the selection of exposure variables is not purely based on statistical associations, but also in a conceptual model that describes the logical or theoretical relationships between the determinant factors[20]. In this model, the variables in the upper levels are treated as "confounding" of those at the lower levels, whereas those situated close to the outcome are analyzed as potential mediators of the effects of those located in the distal levels[21].

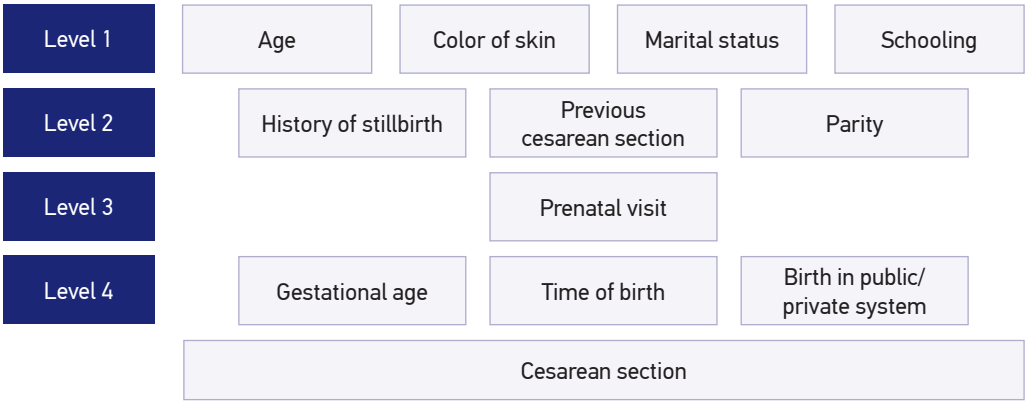

Figure 1. Hierarchical model of multivariate analyzes of factors associated with cesarean occurrence.

In our study, the hierarchical model represented in Figure 1 indicates the order in which the variables were inputted. Variables related to women's characteristics (age, ethnicity/skin color, marital status, and educational level) were included first. Next, the hypothesis that the variables of reproductive history (parity, history of stillbirth, and previous cesarean section) could mediate the association between sociodemographic variables and cesarean section rates was tested by adding these factors in the regression model. Next, the variable "prenatal visit" was added under the assumption that part of the originally allocated effect of sociodemographic and reproductive variables could occur by the frequency of prenatal care. Finally, the "institutional" and "delivery" variables (gestational age, time of birth, and institutional profile) were included as possible mediators of the effect of the factors estimated in previous levels, which were more distal to the outcome. At each level, the variables that showed association with type of delivery ($p < 0.05$) remained in the model in the lower hierarchical levels. The same procedure was adopted for all hierarchical levels. Statistical significance of the associations was calculated by the likelihood ratio test, with predefined 5% significance level. Analyzes were performed with SPSS software 18.0 (SPSS Inc., Chicago, USA).

This study was approved by the Ethics Committee of the *Universidade do Sul de Santa Catarina* under protocol number 19518613.6.0000.5369.

RESULTS

According to SINASC data, 88,926 live births were recorded in 2012 for the Santa Catarina State. In the same year, the cesarean rate for the state was 60.7%. A total of 61,278 live births in singleton pregnancies occurred in 61 hospitals selected for this study. The overall rate of cesarean section in this population was 60.8%, ranging from 89% in private hospitals to 45.1% in public and 57.4% in mixed public/private.

Table 1. Distribution of mothers according to the sociodemographic variables, obstetric history, and type of institution. *Sistema de Informações sobre Nascidos Vivos* for the Santa Catarina State, 2012.

	Public		Private		Mixed public/private		p-value
	n	(%)	n	(%)	n	(%)	
Maternal age							
< 20	2,942	(24.4)	382	(3.5)	6,846	(17.9)	< 0.001
20 – 34	7,894	(65.5)	8,744	(79.4)	26,965	(70.6)	
> 34	1,208	(10.1)	1,893	(17.1)	4,362	(11.5)	
Color of skin							
White	9,503	(88.4)	10,160	(94.7)	31,972	(87.3)	< 0.001
Others	1,252	(11.6)	573	(5.3)	4,667	(12.7)	

Continue...

Table 1. Continuation.

	Public		Private		Mixed public/private		p-value
	n	(%)	n	(%)	n	(%)	
Marital status							
Married/common law marriage	5,930	(49.5)	8,563	(77.8)	27,241	(71.7)	< 0.001
Single/widowed/divorced	6,044	(50.5)	2,444	(22.2)	10,727	(28.3)	
Maternal schooling							
0 – 3	3,713	(31.1)	534	(4.9)	10,629	(28.1)	< 0.001
4 – 8	7,132	(59.7)	4,590	(41.7)	21,252	(56.1)	
> 8	1,105	(9.2)	5,880	(53.4)	5,992	(15.8)	
Prenatal visits							
None	206	(1.7)	60	(5.0)	337	(9.0)	< 0.001
1 – 3	974	(8.1)	142	(1.3)	1,947	(5.1)	
4 – 6	3,632	(30.3)	2,204	(20.1)	8,932	(23.4)	
7+	7,193	(59.9)	8,562	(78.1)	26,889	(70.6)	
Parity							
Primiparae	5,410	(44.9)	5,800	(52.6)	16,573	(43.4)	< 0.001
Multiparae	6,634	(55.1)	5,219	(47.4)	21,600	(56.6)	
History of stillbirth							
Yes	1,993	(17.0)	1,756	(16.7)	5,734	(15.5)	< 0.001
No	9,742	(83.0)	8,732	(83.3)	31,272	(84.5)	
Previous cesarean section							
Yes	2,428	(21.1)	2,961	(28.8)	8,968	(25.0)	< 0.001
No	9,103	(78.9)	7,303	(71.2)	26,856	(75.0)	
Gestational age							
< 37	1,415	(12.1)	1,062	(9.6)	4,088	(10.8)	< 0.001
≥ 37	10,283	(87.9)	9,947	(90.4)	33,725	(89.2)	
Type of birth							
Cesarean section	5,420	(45.1)	9,805	(89.0)	21,916	(57.4)	< 0.001
Vaginal	6,602	(54.9)	1,212	(11.0)	16,245	(42.6)	
Time of birth							
06:00 – 23:59	10,194	(84.7)	10,135	(92.0)	33,309	(87.9)	< 0.001
24:00 – 05:59	1,844	(15.3)	879	(8.0)	4,579	(12.1)	

Table 1 shows the distribution of mothers according to sociodemographic and reproductive variables and type of institution. Users of private hospitals, compared to women who gave birth in public hospitals and mixed public/private hospitals, were older and were included in the groups with higher educational levels. Births among teenagers were about seven times more likely to occur in the public hospitals and five times more common in mixed public/private maternities compared to private hospitals. Private hospitals had higher proportion of white-skinned women, who were married or were in a consensual union, as well as higher prevalence in optimal levels of frequency to prenatal care (seven or more visits). On the other hand, preterm pregnancies were more prevalent in public and mixed public/private hospitals, as well as the history of stillbirth in past pregnancies. The number of deliveries in the night/early morning shift (midnight to 6 a.m.) in public hospitals (15.3%) was almost twice that observed in women who delivered at private hospitals (8%) in the same shift. The history of previous cesarean section was more common among women in the private system, and the number of births by cesarean section in private hospitals (89%) was almost the double of that recorded in the public system (45.1%) and in the public/private mix system (57.4%).

Table 2 shows the associations of the independent variables with cesarean prevalence in the population of the study.

Women with previous cesarean section, aged over 35 years, with the highest level of schooling, white-skinned, who gave birth during the day shift and who were assisted in

Table 2. Prevalence ratios and confidence intervals for the association of sociodemographic, reproductive, and institutional variables with cesarean section rates. *Sistema de Informações sobre Nascidos Vivos* for the Santa Catarina State, 2012.

Variables	Births n	Cesarean section n (%)	PR_B	PR_A	$95\%CI_{(RPAJ)}$	p-value
Institution type						
Public	12,022	5,420 (45.1)	1.00	1.00		
Private	11,017	9,805 (89.0)	1.97	1.44	1.39 – 1.50	< 0.001
Mixed	38,161	21,916 (54.7)	1.27	1.15	1.11 – 1.19	< 0.001
Maternal age						
< 20	10,163	4,493 (44.2)	1.00	1.00		
20 – 34	43,578	27,320 (62.7)	1.42	1.32	1.27 – 1.37	< 0.001
> 34	7,459	5,328 (71.4)	1.62	1.47	1.40 – 1.54	< 0.001
Color of skin						
White	51,605	32,173 (62.3)	1.24	1.06	1.02 – 1.07	< 0.05
Others	6,488	3,250 (50.1)	1.00	1.00		

Continue...

Table 2. Continuation.

Variables	Births n	Cesarean section n (%)	PR_B	PR_A	$95\%CI_{(RPAJ)}$	p-value
Marital status						
Married/common law marriage	41,712	26,626 (63.8)	1.82	1.02	0.99 – 1.04	0.21
Others	19,203	10,372 (54.0)	1.00	1.00		
Maternal schooling						
None						
1 – 3	14,868	6,858 (46.1)	1.00	1.00		
4 – 8	32,953	19,299 (58.6)	1.27	1.08	1.05 – 1.11	< 0.001
> 8	12,970	10,789 (83.2)	1.80	1.18	1.14 – 1.23	< 0.001
Prenatal visits						
None	602	213 (35.2)	1.00	1.00		
1 – 3	3,060	1,234 (40.3)	1.14	1.25	1.05 – 1.47	< 0.050
4 – 6	14,761	7,902 (53.5)	1.51	1.38	1.18 – 1.61	< 0.001
7+	42,619	27,713 (65.0)	1.83	1.49	1.27 – 1.74	< 0.001
Parity						
Primiparae	27,772	17,970 (64.7)	1.00	1.00		< 0.001
Multiparae	33,428	19,171 (57.4)	1.13	2.16	2.09 – 2.24	
History of stillbirth						
Yes	9,477	6,015 (63.5)	1.00	1.00		< 0.01
No	49,720	29,779 (59.9)	1.06	1.06	1.04 – 1.08	
Previous cesarean section						
Yes	14,353	12,534 (87.3)	1.00	1.00		< 0.001
No	43,236	22,313 (51.6)	1.69	2.58	2.58 – 2.78	
Gestational age						
< 37	6,559	3,891 (59.3)	1.00	1.00		0.107
≥ 37	53,926	32,939 (61.1)	1.03	0.97	0.94 – 1.01	
Time of birth						
06:00 – 23:59	53,609	34,689 (64.7)	1.13	1.17	1.68 – 1.84	< 0.001
24:00 – 05:59	7,295	2,239 (30.7)	1.00	1.00		

PR_C: crude prevalence ratio; PR_A: adjusted prevalence ratio: to all variables according to the hierarchical model.

private hospitals, presented the highest cesarean rates. The effect of these variables in the occurrence of cesarean section remained after controlling for confounders.

Among the multiparous women with previous cesarean section, the odds of occurrence of a new cesarean section, compared to multiparous women with only previous vaginal birth, remained more than the double (PR = 2.58; $p < 0.01$) after adjustment in the multivariate model; the same occurred to primiparae compared to multiparae (PR = 2.16; $p < 0.01$). Among women who gave birth in the private hospitals, the rates were almost twice as high (89 vs. 45.1%) than among those assisted in the public hospitals, preserving the independent effect after adjusting for all variables of the model (PR = 1.44; $p < 0.01$).

Significant independent associations with cesarean section also occurred among women aged 35 years or more (PR = 1.47; $p < 0.01$), among those with seven or more visits during the prenatal care (RP = 1.49; $p < 0.01$), and among deliveries during the day shift compared to those at night (PR = 1.17; $p < 0.01$). Schooling over 8 years showed a significant effect mediated by the other social variables, such as "delivery in private hospitals," "reproductive variables," and "previous cesarean section", with a considerable decrease in the effect after adjustment (PR = 1.8 to PR = 1.18), maintaining the statistical significance ($p < 0.01$).

Although preterm gestational age and marital status "married/common law marriage" have presented higher gross risk, they lost strength and statistical significance after adjustment. Results of the factors associated with cesarean section rates described earlier were used in the selection of risk groups for cesarean section. These results are shown in Table 3.

Table 3. Prevalence, prevalence ratio (PR), and confidence intervals for cesarean section rates according to the risk groups for cesarean and delivery social category. *Sistema de Informações sobre Nascidos Vivos* for Santa Catarina State, 2012.

Risk categories	Cesarean				PR_B	PR_A	95%CI	p-value
	Public		Private					
	n	(%)	n	(%)				
Age ≥ 35 years	654	(54.3)	1,711	(90.4)	1.67	1.31	1.17 – 1.46	< 0.001
White skin color	4,337	(45.7)	9,047	(89.1)	1.95	1.57	1.50 – 1.64	0.050
Schooling ≥ 8 years	696	(63.1)	5,348	(91.0)	1.44	1.32	1.22 – 1.44	< 0.001
Prenatal visits ≥ 7	3,477	(48.4)	7,672	(89.6)	1.85	1.54	1.46 – 1.61	<0.001
Parity (primiparae)	2,565	(47.5)	5,250	(90.5)	1.91	1.64	1.55 – 1.74	< 0.001
Previous cesarean section	1,902	(78.4)	2,892	(97.7)	1.25	1.17	1.09 – 1.26	< 0.001
Time of birth (06:00 – 24:00)	5,030	(49.4)	9,174	(90.5)	1.83	1.51	1.45 – 1.58	< 0.001
History of stillbirth	967	(48.6)	1,585	(90.3)	1.86	1.52	1.38 – 1.67	< 0.001

PR_C: crude prevalence ratio; PR_A: adjusted prevalence ratio: to all variables according to the hierarchical model.

Since mixed public/private hospitals had significant variation in the measurement used for classification of the hospitals (ratio of beds: private/public), an expected difference in the distribution of independent variables do not ensure comparability with the other categories of institutions in the study. For this reason, the mixed public/private hospitals were not included in Table 3.

Statistically significant differences were found among all risk groups, with a higher risk of cesarean section among women assisted in the private sector, when compared to those of the same groups who gave birth in public hospitals; these effects maintained significance after adjustment for confounders. When birth occurred in private maternities, primaparae, white-skinned women, with a higher quantity of prenatal visits, delivery during the day shift, and history of stillbirth in previous pregnancy had a higher than 50% probability of caesarean section (PR > 1.5) when compared to those assisted in public hospitals. Among women aged 35 years and over and with 8 years of schooling or more, who gave birth in private hospitals, the excess risk of caesarean section was higher than 30% (PR > 1.3). Among those who had previous cesarean section and delivery in the private system, the probability of a new cesarean section was 17% higher than among their peers assisted in public institutions.

DISCUSSION

The study results showed higher cesarean section rates among women who gave birth in private hospitals compared to pregnant women assisted in public hospitals. When comparing the two types of institutions, the most significant differences in favor of births in private hospitals were found between primiparae, white-skinned women, with a higher quantity of prenatal visits, and with births occurring between 6 a.m. and midnight.

Recent document concerning the work of "Consolidation of SINASC data, 2011"[22] emphasizes data completeness and reliability for the South Region of Brazil, highlighting the inclusion of new variables such as "previous births," which allow adjustment to previous cesarean section, which is an important confounding factor. Other variables considered risk factors for cesarean section as "parity" and "birth time," can now also be included in the analyzes. In this study, the inclusion of variables not previously used and the representativeness of the Santa Catarina State by means of a wide selection of maternity hospitals in the different macroregions guarantee the originality of the study.

The caesarean section rate in the state of Santa Catarina related to the sample of singleton live births at the 61 establishments in our study (60.8%), is aligned with the data provided by SINASC for the same year of 2012, which registers a rate of 60.7% when considering all births with the same characteristics of the selected sample. Differences in cesarean section rates, when comparing selected hospitals according to the institutional profile (public/private), with rates of almost double among women who gave birth in private hospitals when compared to pregnant women assisted by the public system (89 vs.

45.1%), and an intermediate value between the mixed public/private hospitals are also in accordance with other studies conducted in Brazil[2,7,9,11].

Findings from a profile with worst socioeconomic and demographic indicators among users of public hospitals, including lower levels of education and disadvantaged ethnic groups, have been described in other studies in Brazil[11,23]. Similarly, higher cesarean rates among more privileged socioeconomic groups, that is, exactly among women admitted more frequently in private hospitals, corroborate findings from other authors[2,7-11,23]. According to some of these authors, socioeconomic, educational, and ethnicity inequalities in the prevalence of cesarean section, with the highest rates among groups where better maternal health conditions, lower obstetric risk, and greater exposure to medical technology are expected, suggest abuse of the procedure in the birth assistance[7,10,23].

Social inequalities in cesarean section rates refer to the hypothesis of "inverse equity" as postulated by Hart[24]. According to this author, access to health care services would be available first to individuals who need them least. Risks associated with higher educational levels and older age groups proved to be partially mediated by increased frequency of prenatal care. A study with similar results suggested, as an explanation for these results, the frequent use of strategies within the public sector by women with better socioeconomic status, who, by means of the prenatal visits through the private system, increase the chance of obtaining a cesarean section not only by economic differentiation (additional payment), but mainly by "greater negotiation power with the obstetrician"[13].

Higher rates depending on the time of birth indicate factors associated with the organization of obstetric practice and the convenience for the physician, as already reported by other authors[10,11].

The high cesarean section rates among primiparae in this study are a particular concern for anticipating the cumulative effect of a previous cesarean section in these women[10,23,25]. The prevalence of almost three times of new cesarean section among multiparous with previous cesarean section, which is in the medical community almost absolute indication, reveal deep-seated factors in the obstetric practice, in which the maxim formulated by Cragin in 1916[26], "once a Cesarean, always a Cesarean," still appears to be the rule. With regard to the medical indications for cesarean section, except for previous cesarean section and age over 35 years, which are considered in the medical community as "relative indications," the remaining factors investigated in our study can be labeled as "no strictly medical indications."

Differences found in cesarean section rates according to specific risk groups potentially associated with lack of information or information related to caesarean section, with higher rates among women assisted in the private sector for all risk factors, indicate the influence of the institutional profile on the delivery method. These results suggest greater degree of flexibility in the medical practice of cesarean section indications and increased influence of the obstetrician, in the private sector, when deciding by a cesarean section, compared to "relative indications" concerning this type of delivery, as suggested by other studies[4,8,14].

According to the mothers interviewed in the National Demographic and Health Survey (PNDS) in 2006, 46% of all cesarean sections had been scheduled in advance[27]. In our study, the results showed that cesarean sections are performed more often in daytime hours, and the probability of occurring in that period is significantly higher among women assisted in the private system. Other studies suggest that the convenience for obstetricians and the highest proportion of elective cesarean sections among women assisted in the private system would explain these results[8,25]. In the context of our study, results of higher incidence of cesarean sections in the private system in daytime hours could indicate excess of elective cesarean sections among women assisted in the private system.

Torres et al.[28] called for a more vigilant role of the Federal Council of Medicine (CFM) in Brazil, as in other countries, by means of recommendations aimed at reducing the high prevalence of prematurity associated with elective cesareans sections as it raises issues related to ethics[28].

An association of the increased frequency of prenatal visits with higher cesarean section rates could at first be attributed to the higher incidence of complications in pregnancy, leading to a greater number of prenatal visits and to a higher probability of cesarean section. However, it is known that complications during pregnancy are much more common among women assisted in the public system than among those assisted in the private system, with the use of less frequent prenatal care by the first group[2].

Different studies conclude that high cesarean section rates in Brazil reflect sociocultural factors and obstetric practice[28] as well as institutional, financial, and legal aspects[29] that constitute the so-called "culture of cesarean section in Brazil."[30] In this study, the high cesarean section rates and the profile of social inequalities related to them indicate a culture of excessive use of medical technology in childbirth as responsible for a great part of the cesarean sections. Higher rates of cesarean sections are associated with increased risk of maternal and perinatal morbidity and mortality[31,32], in addition to raising unnecessary expenses and diverting human, material, and financial resources that could be allocated to other areas of the health system[33].

Methodological limitations in our study are related to the nature of the data obtained from the information systems with the disadvantage of potential to reporting bias when using secondary data and also to the absence of information in that system concerning obstetric indications such as antepartum and intrapartum complications, type of presentation and iterative caesarean section. Moreover, hospital profile classification, which was based on the ratio between public and private deliveries obtained from CNES, does not allow characterizing the institutions included in the study as low or high risk.

However, for the purpose of this study, SINASC data can be considered as a valuable tool to characterize the situation of labor and birth, as it contemplates the majority of sociodemographic and reproductive factors classically associated with cesarean section rates. Differences in the effect of variables such as "delivery shift," "previous cesarean section," "educational level," and "early admission" on cesarean section rates, when comparing the hospitals, indicate potential differences in obstetric practice and, consequently, the degree of flexibility or permeability of the medical conduct in the cesarean section indications.

CONCLUSION

This study results reinforce the apparent paradox that women with better socioeconomic conditions and potential lower risk of complications in childbirth have greater chance to undergo cesarean section, compared to those with lower purchasing power and greater obstetric risk.

Consequences of indiscriminate use of cesarean section in our midst become relevant when considering the results of other authors, which show that women undergoing caesarean section in the public system accumulate risk factors for complications after childbirth and these effects are potentiated by the worst living conditions and lower social support after hospital discharge[2].

The comprehension of the sociocultural nature of high cesarean section rates is increasing, but there is no consensus on the best solutions to the problem. In Brazil, several nongovernmental entities have invested in birth humanization actions, including continued support during childbirth by health professionals or by lay people, stimulus to the presence of a companion, and active participation of the mother and partner during childbirth[33]. However, the results of these measures have not yet been widely disseminated.

The multifactorial causes determining the cesarean section rates in Brazil, including important regional and cultural differences, suggest interventions focused on medical staff, on the relationship of the pregnant woman with prenatal care assistance, and organization of services in the maternity wards. Studies that address the clinical conditions of the mother and the attitudes of the obstetric team, the pregnant woman, and the family in relation to the type of delivery may clarify how socioeconomic inequalities operate in determining the cesarean section.

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Received on: 03/02/2015
Final version presented on: 02/11/2016
Accepted on: 03/24/2016