

Analysis of caesarean section rate in a referral hospital in Southern Brazil: Associated factors and Robson classification

Análise da taxa de cesariana em hospital de referência no sul do Brasil: fatores associados e classificação de Robson

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Abstract

Overview and Aims: Indiscriminate increasing number of caesarean section has raised interest worldwide and has been subject of countless discussion. The aim of this study was to analyze the caesarean section rate according to Robson classification and to identify associated factors in a referral hospital in Southern Brazil.

Study Design: Cross-sectional study.

Population: Data from all births occurred in one-year-period carried out at a referral hospital in the southern Brazilian state of Santa Catarina.

Methods: Gestational characteristics were categorized according to Robson classification criteria. The dependent variable was caesarean section rate and the clinical-obstetric characteristics were the independent variables. Adjusted models were obtained through Poisson Regression analysis.

Results: The caesarean section rate was 35.5%. According to Robson classification, group 3 showed the highest occurrence. Among the groups with greatest impact in caesarean section rates, group 5 showed the highest proportion among all cesareans. Prevalence of statistically higher caesarean section rate was found in women aged 25 and 35 years and who had previously performed caesarean section. Statistically lower prevalence was found in women who had previous vaginal delivery, with spontaneous labor and those with induced labor.

Conclusion: The highest caesarean section rate was observed in group 3 of Robson classification. Age and previous caesarean section were shown to be associated with the higher caesarean section rates.

Keywords: Caesarean section; Prevalence ratio; Robson criteria.

Resumo

Visão Geral e Objetivos: O aumento indiscriminado do número de cesarianas tem despertado interesse em todo o mundo e tem sido objeto de inúmeras discussões. O objetivo deste estudo foi analisar a taxa de cesarianas segundo a classificação de Robson e identificar os fatores associados em um hospital de referência no sul do Brasil.

Desenho do Estudo: Estudo transversal.

População: Dados de todos os partos ocorridos no período de um ano realizados em um hospital de referência no sul do estado brasileiro de Santa Catarina.

Métodos: As características gestacionais foram categorizadas de acordo com os critérios de classificação de Robson. A variável dependente foi a taxa de cesariana e as características clínico-obstétricas foram as variáveis independentes. Os modelos ajustados foram obtidos por meio da análise de Regressão de Poisson.

Resultados: A taxa de cesariana foi de 35,5%. De acordo com a classificação de Robson, o grupo 3 apresentou a maior ocorrência. Entre os grupos com maior impacto nas taxas de cesarianas, o grupo 5 apresentou a maior proporção entre todas as cesarianas. A prevalência de taxa de cesariana estatisticamente maior foi encontrada em mulheres com idade entre 25 e 35 anos e que já haviam realizado cesariana anteriormente. Prevalência estatisticamente menor foi encontrada em mulheres que tiveram parto vaginal prévio, com trabalho de parto espontâneo e naquelas com trabalho de parto induzido.

Conclusão: A maior taxa de cesariana foi observada no grupo 3 da classificação de Robson. A idade e cesariana anterior mostraram-se associadas às maiores taxas de cesariana.

Palavras-chave: Cesárea; Taxa de prevalência; Classificação de Robson.

INTRODUCTION

Nearly 20 million caesarean section (CS) are performed yearly, electing it as the most practiced surgical intervention in the world^{1,2}. Nonetheless, the indiscriminate increasing number of CS has raised interest worldwide and has been subject of countless discussion^{3,4}. In 1985, the World Health Organization (WHO) declared that CS rates over 10-15% are not justifiable³.

Nowadays, considering differences among institutions due to different contexts, populations, local resources and available knowledge, these rates have been rediscussed⁴. The use of CS worldwide has increased to unprecedented levels although the gap between higher- and lower-resource settings remains⁵. Latin America and the Caribbean region have the highest CS rates (40.5%), followed by Northern America (32.3%), Oceania (31.1%), Europe (25%), Asia (19.2%) and Africa (7.3%)⁵.

Brazil experiences an epidemic of CS, bearing roughly 1.6 million surgeries performed every year⁶. During the last decades, the national rate has been increasing progressively, becoming the most common birth mode in the country, coming from 15.6% (1970) to 34.6% (1996)⁷. Currently, CS rate is at 55.6%, with a significant difference between public (40%) and private service (85%)⁶.

The improvement in perinatal and maternal morbidity due to the increment in CS rates is not well defined. The risk of placenta praevia, placental accretion and uterine rupture in future pregnancies, especially those performed electively and without proper clinical or obstetric indication have been demonstrated. However, the judicious increase of CS could improve perinatal outcome⁸.

Furthermore, the performance of unnecessary CS in women at gestational age near 37 weeks is an important factor of respiratory discomfort occurrence and hospitalization in neonatal intensive care unit⁹.

Until 2015, there was not a standardized and internationally accepted system to monitor CS rates. Hence, WHO¹⁰ carried out a systematic review about existing protocols to classify CS and concluded that the Robson classification would be a standard tool to assess, monitor and compare CS rates over time. This system classifies pregnant women in ten groups mutually exclusive and totally inclusive (Table I)^{10,11}. It has been shown to be a simple, robust, repeatable, and clinically relevant method, which allows comparison and analysis of CS rates within each group and among themselves¹².

The use of tools, such as the Robson classification, which optimize the indication of CS procedures, is essential for helping to decrease the global rates and improving institutional results upon prioritizing interventions in specific groups which are particularly relevant in each place. Besides, it allows the assessment of assistance quality and practices in clinical cares and outcomes by group. Therefore, the objective of this study is to analyze the rate of CS according to Robson classification and to identify associated factors with its occurrence in a referral hospital in southern Brazil.

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TABLE I. ROBSON CLASSIFICATION SYSTEM.

1	Nulliparous women with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labour
2	Nulliparous women with single cephalic pregnancy, ≥ 37 weeks gestation who either had labour induced or were delivered by caesarean section before labour
3	Multiparous women without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labour
4	Multiparous women without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation who either had labour induced or were delivered by caesarean section before labour
5	All multiparous women with at least one previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation
6	All nulliparous women with a single breech pregnancy
7	All multiparous women with a single breech pregnancy, including women with previous uterine scars
8	All women with multiple pregnancies, including women with previous uterine scars
9	All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars
10	All women with a single cephalic pregnancy < 37 weeks gestation, including women with previous scars

METHODS

A cross-sectional study was carried out at *Hospital Regional de São José*, in the metropolitan region of Florianópolis, Santa Catarina, Brazil. This is a tertiary-level hospital and managed by the State Health Department of Santa Catarina, serving exclusively through the Unified Health System (*Sistema Único de Saúde – SUS*). The *Hospital Regional de São José* is responsible for a demographic area of approximately 500 thousand inhabitants and performs about 300 births monthly.

Data was obtained from pregnant's records in one-year-period. Births whose records did not allow proper data collection, as previous type of delivery or fetal presentation, were excluded. An assessment instrument specially designed by the researchers for this study was used to collect sociodemographic and actual obstetric information. Data regarding obstetric antecedents (nulliparous or multiparous), number of fetuses (one or more), fetal presentation (cephalic, breech or transverse), onset of labor (spontaneous, induced), CS prior to labor and gestational age (term or preterm) were collected. The sociodemographic variables (maternal age and skin color) were also collected and were initially described in absolute numbers and proportions. Gestational characteristics were categorized according to Robson classification criteria¹².

Patients' records were classified in one of the ten groups or as unclassified and the reasons to submit them to CS were grouped by similarity. Association stu-

dies were carried out using chi-square test or Fisher's exact test. The dependent variable was CS rate and patients' age, skin color and clinical obstetric characteristics were the independent variables. All variables with $p < 0.20$ values were included in models adjusted through Poisson Regression analysis with robust estimator. In the final model only those with $p < 0.05$ were maintained. Prevalence ratios and their respective 95% confidence intervals were calculated. The statistical analysis was carried out using the software SPSS 18.0.

This study was based in the ethical principles from resolution 466/12 by the Brazilian National Health Council. The project was approved by the Ethics and Research Committee of the Universidade do Sul de Santa Catarina under CAAE 78646317.8.0000.5369.

RESULTS

The total of deliveries in one-year-period was 3,593. 70 patients were considered unclassified according to the Robson classification (2.0%). These records were excluded for the subsequent analysis. The total number of CS was 1,249 corresponding to 35.5% of all births.

Patient's age varied from 13 to 46 years old, and the median age was 27.7 years old. Caucasians were the most prevalent ethnic group (70.8%). The primiparae (41.5%), full-term pregnancy (91.0%), spontaneous onset of labor (67.6%), fetal cephalic presentation (96.6%) and pregnant women with a singleton fetus

TABLE II. CAESAREAN SECTION RATES ACCORDING TO ROBSON CLASSIFICATION. (N=3.523).

Groups	Total births	Cesarean proportion in each group	Cesarean proportion among all cesareans
	n (%)	n (%)	n (%)
1	855/3523 (24.3)	203/855 (23.7)	203/1249 (16.2)
2	412/3523 (11.7)	248/412 (60.2)	248/1249 (19.8)
3	958/3523 (27.2)	58/958 (6.1)	58/1249 (4.6)
4	226/3523 (6.5)	73/226 (32.3)	73/1249 (5.8)
5	660/3523 (18.8)	422/660 (63.9)	422/1249 (33.8)
6	62/3523 (1.7)	60/62 (96.8)	60/1249 (4.8)
7	64/3523 (1.8)	63/64 (98.4)	63/1249 (5.0)
8	23/3523 (0.7)	19/23 (82.6)	22/1249 (1.8)
9	5/3523 (0.1)	5/5 (100.0)	5/1249 (0.4)
10	255/3523 (7.2)	95/255 (37.3)	95/1249 (7.6)

(99.3%) were the most frequent occurrences. CS prevalence rate was higher among patients over 30 years old (45.8%), multiparous with just previous CS (73.6%), premature gestations (41.8%), induced labors (44.6%), breech presentations (97.4%) and twinning (82.6%).

According to Robson classification, group 3 (multiparous, without previous uterine scar, singleton fetus, cephalic, full-term pregnancy with spontaneous labor) presented the highest prevalence of births (27.2%), followed by group 1 (nulliparous, singleton fetus, cephalic, full-term, spontaneous labor) with 24.3%, group 5 (multiparous, with previous uterine scar, singleton fetus, cephalic, full-term pregnancy) with 18.8%, group 2 (nulliparous, without previous uterine scar, singleton fetus, cephalic, full-term pregnancy with induced or elective CS) with 11.7% and group 4 (multiparous, without previous uterine scar, singleton fetus, cephalic, full-term pregnancy with induced or elective CS) with 6.5% (Table II).

The highest CS rates occurred in group 9 (singleton fetus, transverse, or oblique lie, including women with previous uterine scar), in which 100% of the pregnant women underwent CS, followed by groups 7 (multiparous, singleton fetus, breech, including women with previous uterine scar), with 98.4% and 6 (nulliparous, singleton fetus, breech), with 96.8%, which represent groups which include non-cephalic presentations. However, groups 6-9 had little impact on the final cesarean

rate. Among the groups with greatest impact in CS rates, group 5 was the one that presented the highest prevalence of births (63.9%), followed by group 2 (60.2%), group 4 (32.3%) and group 1 (23.7%). CS rates under the average were shown in group 3, followed by groups 1 and 4 with 23.7% and 32.3%, respectively (Table II).

With respect to the number of CS of each group and the representativeness in the total rate, it was observed that group 5 (multiparous, with previous uterine scar, singleton fetus, cephalic, full-term) presented the highest contribution, with 33.8% of the deliveries via CS (Table II). The most prevalent reason to perform CS was non-reassuring fetal status (24.1%), followed by previous c- (18.5%) and progression failure (15.4%) (Table II).

Using patients under than 25 years old as reference, pregnant women aged 25 to 30 presented 12% higher prevalence [PR 1.12 (1.02-1.24); p=0.019] and those older than 30 years presented 18% higher prevalence of CS [PR 1.18 (1.07-1.31); p=0.001]. Patients who had already had vaginal delivery before presented prevalence 18% lower of CS [PR 0.82 (0.72-0.93); p=0.003], whereas those who had already had previously CS presented 24% higher prevalence of CS [PR 1.24 (1.08-1.41); p=0.002] when compared to those who had already had both a vaginal delivery and a CS. Pregnant woman with induced labor presented prevalence 20% more CS than those with spontaneous

TABLE III. DISTRIBUTION OF CLINICAL-OBSTETRIC CHARACTERISTICS AND RESULTS OF BIVARIATE ANALYSIS. (N=3,523).

Clinical-obstetric characteristics	Birth route			p-value
	Cesarean n (%)	Vaginal delivery n (%)	Total n (%)	
Patient's age				
< 19 years old	110 (23.1)	366 (76.9)	476 (13.5)	
19-24 years old	440 (32.2)	925 (67.8)	1365 (38.7)	0.133
25-30 years old	363 (38.3)	585 (61.7)	948 (26.9)	0.019
> 30 years old	336 (45.8)	398 (54.2)	734 (20.8)	< 0.001
Skin color				
Non-caucasian	309 (30.0)	720 (70.0)	1029 (29.2)	0.635
Caucasian	865 (34.7)	1629 (65.3)	2494 (70.8)	
Parity				
Primipara	566 (38.7)	867 (61.3)	1463 (41.5)	0.840
Multiparous without CS	193 (14.7)	1118 (85.3)	1311 (37.2)	0.003
Multiparous with CS	415 (73.6)	149 (26.4)	564 (16.0)	0.002
Multiparous with CS and VD	75 (40.5)	110 (59.5)	185 (5.3)	
Gestational age				
< 37 weeks	132 (41.8)	184 (58.2)	316 (9.0)	
≥ 37 weeks	1117 (34.8)	2090 (65.2)	3207 (91.0)	0.312
Onset of labor				
Spontaneous	486 (20.4)	1897 (79.6)	2383 (67.6)	< 0.001
Induced	303 (44.6)	376 (55.4)	679 (19.3)	< 0.001
Elective CS	460 (99.8)	1 (0.2)	461 (13.1)	
Fetal presentation				
Cephalic	1132 (33.3)	2271 (66.7)	3402 (96.6)	0.201
Breech	112 (97.4)	3 (2.6)	115 (3.3)	0.968
Others	5 (100)	–	5 (0.1)	
Twinning				
Yes	19 (82.6)	4 (17.4)	23 (0.7)	0.052
No	1230 (35.1)	2270 (64.9)	3500 (99.3)	

CS: Cesarean section; VD: Vaginal Delivery; PR: Prevalence Ratio.

onset of labor. All associations were described according to bivariate (Table III) and multivariate analysis (Table IV).

DISCUSSION

This research was carried out in a referral health center for expecting women, thus allowing an initial analysis of the Robson classification in the studied region. The general CS rate (35.5%) was in line with data from the region's public sector (36.5%)¹³, as well as indices

in Latin America (33.0%)¹⁴. However, much lower than those found in Brazil, when public and private sectors are both considered (55.0%)¹⁴⁻¹⁶. Otherwise, this rate is higher than those found internationally (23.2%) in developed countries¹⁷.

The increase in the CS rate over the last years may be resulting from a combination of factors. Convenience and protagonism of obstetricians in the assistance to birth and difficulty in obtaining techniques to relieve pain by the public health system, due to the lack of analgesia for this population. Also, the perception of a considerable number of women about a possible superiority

TABLE IV. RESULTS OF MULTIVARIATE ANALYSIS FOR CESAREAN OCCURRENCE.

Clinical-obstetric characteristics	CS			
	PR _c (CI 95%)	p-value	PR _a (CI 95%)	p-value
Patient's age				
< 19 years old	1.00		1.00	
19-24 years old	1.074 (0.97-1.17)	0.133	1.07 (0.98-1.18)	0.133
25-30 years old	1.12 (1.01-1.23)	0.019	1.12 (1.02-1.24)	0.019
> 30 years old	1.18 (1.07-1.31)	< 0.001	1.18 (1.07-1.31)	0.001
Parity				
Primipara	0.98 (0.86-1.12)	0.840	0.99 (0.87-1.12)	0.840
Multiparous without CS	0.81 (0.71-0.93)	0.003	0.82 (0.72-0.93)	0.003
Multiparous with CS	1.23 (1.07-1.41)	0.002	1.24 (1.08-1.41)	0.002
Multiparous with CS and VD	1.00		1.00	
Gestational age			#	#
< 37 weeks	1.00			
≥ 37 weeks	0.95 (0.86-1.04)	0.312		
Onset of labor				
Spontaneous	0.60 (0.56-0.64)	< 0.001	0.60 (0.56-0.65)	< 0.001
Induced	0.72 (0.66-0.79)	< 0.001	0.72 (0.66-0.79)	< 0.001
Elective CS	1.00		1.00	
Fetal presentation			#	#
Cephalic	0.66 (0.35-1.23)	0.200		
Breech	0.98 (0.52-1.85)	0.968		
Others	1.00			
Twinning				
Yes	0.74 (0.54-1.00)	0.052	0.74 (0.55-1.00)	0.052
No	1.00		1.00	

CS: Cesarean section, VD: Vaginal Delivery, RP_c: Crude prevalence ratio, RP_a: Adjusted prevalence ratio. #: removed from the model for not fulfilling the inclusion criterion.

of the surgical route over the vaginal delivery may be cited. Furthermore, it is possible to mention an idealization of the CS as a risk-free procedure, a way to be born cleanly and organized¹⁸. The lack of information on labor and the imposition of interventions without scientific basis make vaginal delivery a painful and negative experience. The pain has been the main reason for the preference for CS. This has been an issue to be solved in the public and private health sectors¹⁷.

Control requirements and monitoring of labor dynamics partially explain the high levels of CS. Currently, the obstetricians' preference for surgical route of labor may be analyzed by the convenience of a planned intervention, opposite to the vaginal delivery, which occurs at any time and may take a long and unpredictable period¹⁸.

In the present study, the highest CS rates occurred in patients aged over 30 years old, multiparous with previous CS, prematurity, induced labor, anomalous and twinning presentations, like the results found by other authors¹². The hypothesis that older patients may present more comorbidities or are related to other characteristics, which may lead to more CS, is suggested. The data here presented, as well as those pointed out by other authors, highlight the occurrence of a previous CS as an important factor for the increase in CS rates^{13,14,19-21}. Patients who underwent labor induction, on the other hand, presented higher CS rate (44.6%) than those with spontaneous labor, like the results found in other studies^{19,22}. An analysis of these cesarean section indications and the induction failures criteria should be reviewed for

better interpretation and adequacy of possible resolutions.

Upon stratifying the sample in Robson classification, groups 3 and 1 presented the highest proportions (51.3%), corroborating the results found by other authors^{23,24}. Nevertheless, another study which evidenced higher birth rates in groups 1 and 5 was identified¹⁵.

The group with the highest contribution for CS was group 5, corroborating with data from the literature^{15,17,24-28}. This clearly demonstrates the consequences of a previous CS and the strong impact on the likelihood of a subsequent surgical delivery²⁷ Silva et al²⁶. suggest the progressive increase of patients belonging to group 5 in the coming years. Therefore, a proper way to reduce global CS rates would be to prevent the first CS to be carried out.

The main reason for CS during labor were failing to progress and non-reassuring fetal status, whereas, out of labor, previous CS was the most prevalent reason. Similar data were found in another study²⁸.

A high percentage of previous CS is explained not only by the increase in the number of first CS but also by the decrease of attempt of labor in women with previous CS²². There is great concern over the risk of uterine rupture in a vaginal delivery after a CS delivery; however, this risk is considered low, recommending that most women with previous segmental transverse CS be offered a trial of labor²⁹.

Even it is possible to observe that there are factors related to relative and non-medical indications being responsible for higher CS rates. Different studies conclude that the raise in CS in Brazil reflect sociocultural factors and the obstetric practice, as well as institutional, financial, and legal conditions,⁶ which constituted the so called "CS culture"²⁹.

It is important to mention that Robson classification can be very useful on monitoring and reducing CS rates. As mentioned by Boatin et al³⁰. it is a stable framework for categorising and analysing data in the clinical audit process either alone or together with other approaches. It allows standardised comparisons of CS rates across time and settings and the prospective identification of specific groups of women which most contribute to the overall CS rate. The authors pointed out that the Robson classification is useful within clinical audit cycles targeting CS rate reductions.

The 2.0% rate of unclassified patients shows some errors to be correct during data registration. It demonstrates issues to be solved even if this rate would not probably had influenced the final results. This rate of missing data should not be considered an indicator of low-quality service but must be corrected¹¹. A strength point of this study remains in highlighting a very important issue to understand how CS are distributed helping in trying to decrease the unnecessary surgeries for these population. However, the lack of further information is a limitation that could interfere in the results such as clinical and obstetric history. There must be, probably, limitations on the reliability of information. The lack of a professional or a team who reviews cesarean section indications in this service allows bias of registration to be perpetuated. The results found here will constitute the base of information to be compared to future changes in the service itself and as a reference to others.

This study demonstrated the importance of identifying CS rates and associated factors, providing data for planning efficient measures aiming to reduce the high rates and changing obstetric practices. Strategies to decrease the frequency of CS must be included to avoid the first unnecessary surgery¹⁷, allowing the preparation of clinical protocols to encourage vaginal delivery after a CS. Finally, reviewing existent policies and practices, besides planning intervention to improve institutional results is suggested.

It can be concluded that the total CS rate was 35.5% with higher prevalence among pregnant women over 30 years old, multiparous with just previous CS, premature births, induced labor, breech presentation and twinning. Groups 1 and 3 of the Robson classification were the most prevalent. The highest contributions to the global rates of CS were groups 5, 2 and 1, respectively. The main reasons to perform CS were non-reassuring fetal status, previous CS and progression failure.

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Maria Luisa Cazula Milléo – concept of the investigation project, analysis and interpretation of data, writing and critical review of the manuscript.

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