

Sociodemographic variables associated with the Robson Ten-Group Classification System in the State of São Paulo, Brazil

Variáveis sociodemográficas associadas ao Sistema de Classificação de Robson em Dez Grupos no Estado de São Paulo, Brasil

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ABSTRACT

This observational study evaluated the associations between the groups of the Robson Classification System and maternal sociodemographic characteristics among neonates in São Paulo State, Brazil, 2019. The groups 5, 6, 7, 8 and 9 tend to be associated with cesarean delivery and more privileged educational opportunities, while the groups 1, 4 and 3 tend to be associated with vaginal delivery and less privileged educational opportunities. These results reinforce the notion that strategies for reducing cesarean deliveries should go beyond a biomedical model focused on biological factors and should also consider the social factors that characterize the living conditions of people.

Keywords: Cesarean Section; Socioeconomic Factors; Health Information Systems.

RESUMO

Este estudo observacional avaliou as associações entre os grupos do Sistema de Classificação de Robson e as características sociodemográficas maternas entre neonatos do Estado de São Paulo, Brasil, 2019. Os grupos 5, 6, 7, 8 e 9 tendem a ser associados ao parto cesáreo e a oportunidades educacionais mais privilegiadas, enquanto que os grupos 1, 4 e 3 tendem a ser associados ao parto vaginal e a oportunidades educacionais menos privilegiadas. Estes resultados reforçam a noção de que as estratégias para reduzir o parto cesáreo devem ir além de um modelo biomédico centrado em fatores biológicos e devem também considerar os aspectos sociais que caracterizam as condições de vida das pessoas.

Palavras-chave: Parto Cesáreo; Fatores Socioeconômicos; Sistemas de Informação em Saúde.

INTRODUCTION

Despite the recommendation of the World Health Organization that the optimal cesarean delivery (CD) rate should be 10-15%, the rate of CD in Brazil has reached 55.8% [1,2]. Effective strategies to lower these rates must be

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based on the assessment of each case in order to identify the most frequent patient groups undergoing cesarean section. In this way, the Robson Ten Group Classification System (RTGCS) aims to classify pregnant women into clinically relevant groups to allow assessment of the frequency of CD in each, and it may also be helpful for public health purposes in allocating resources [3]. Based on obstetric characteristics, the RTGCS classifies women into ten groups [4], as follows:

- 1 Nulliparous, singleton, cephalic, full-term, spontaneous labour;
- 2 Nulliparous, singleton, cephalic, full-term, induced labour or prelabour caesarean section;
- 3 Multiparous, singleton, cephalic, full-term, without a previous cesarean delivery (CD), spontaneous labour;
- 4 Multiparous, singleton, cephalic, full-term, without a previous uterine scar, induced labour or prelabour caesarean section;
- 5 Multiparous, singleton, cephalic, full-term, with a previous CD;
- 6 Nulliparous, singleton, breech;
- 7 Multiparous, singleton, breech;
- 8 All multiple pregnancies;
- 9 Singleton, transverse or oblique lie; and
- 10 Singleton, cephalic, preterm.

A recent ecological study showed that in Brazil, the frequencies of each group of the RTGCS are heterogeneously distributed in the geographic space, with meaningful associations with the proportion of poverty in the different regions [5].

São Paulo is the most populous Brazilian state (44.04 million inhabitants), responsible for over 30% of the gross national rate. The objective of the present study is to evaluate the associations between the groups of the RTGCS and some variables, including maternal sociodemographic characteristics, among live-born neonates in the State of São Paulo, southeast Brazil, in 2019.

METHODS

This is an observational study based on public data from the Brazilian Information System on Live Births (SINASC, acronym in Portuguese). The data for the year 2019 was used, including in total 583,191 live-born neonates. After eliminating the records with missing information or unknown RTGCS classification, the final dataset included 546,885 neonates.

In addition to RTGCS, the other variables considered were: maternal age (grouped as <20, 20-24, 25-29, 30-34, 35-39, 40-44, and ≥ 45 years), marital status of mother (single, married, widowed, divorced, and consensual union), mother's schooling (following the Brazilian classification: no schooling, elementary I, elementary II, high school, and higher education), onset of prenatal care (without prenatal care, first, second, and third trimester), method of delivery (cesarean and vaginal), and birthweight for gestational age based on the curves from the Intergrowth-21st project (small [SGA], adequate [AGA], and large for gestational age [LGA]) [7]. LGA was defined as a birthweight greater than the 90th percentile, and SGA was defined as a birthweight less than the 10th percentile. The ethnicity of the mother was also considered, according to the classification used by the Brazilian Institute of Geography and Statistics (IBGE) in the national demographic censuses (white, black, Asian, brown, and Indigenous) [6].

Correspondence analysis is a popular visual tool used to explore association structures between categorical variables, and in the present paper, it allowed us to describe that deep socioeconomic inequalities characterize the CD frequencies among RTGCS groups. Multiple Correspondence Analysis (MCA) was applied with the "FactoMineR" package or R software (version 3.6.0) to assess the relationships among the variables graphically [8]. MCA is a multivariate analysis technique that displays relationships between response variables and a set of categorical explanatory variables

in a low-dimensional space, called a correspondence map. Interpretation of the results of an MCA is thus based upon proximities between points in this low-dimensional graph, where each point represents a class of a categorical variable. Characteristics similar to the average population profile (showing low association with other variables) are plotted close to the centroid of the map (located at coordinate (0,0)). In contrast, characteristics highly dissimilar to the average profile are plotted near the margins of the correspondence map.

This study was conducted exclusively with public-domain secondary data, without identifying subjects, and its procedures are guided by the principles of ethics in research involving human participants. Thus, the study was waived from formal review and informed consent by the institutional Research Ethics Committee, according to Resolution 510 of April 7, 2016, of the National Health Council, which determines the norms and guidelines for conducting research involving humans in Brazil. The study was conducted according to the Helsinki declaration and good clinical practice.

RESULTS

The 546,885 live-born neonates included in this study were born at gestational age between 29 and 43 weeks. The frequencies of mothers classified into the groups 1 to 10 of the RTGCS were 74,752 (13.7%), 103,395 (18.9%), 84,229 (15.4%), 63,009 (11.5%), 145,911 (26.7%), 7,316 (1.3%), 9,330 (1.7%), 12,970 (2.4%), 1,076 (0.2%), and 44,897 (8.2%), respectively. Group 5 was the most frequent (multiparous, singleton, cephalic, full-term, with a previous CD), with a little over a quarter of the births in the state of São Paulo (26.7%). Among the neonates, 429,261 (78.5%) were classified as AGA, 37,119 (6.8%) as SGA, and 80,505 (14.7%) as LGA. The frequency of CD was 59.1%. A little more than half of the mothers (299,188 mothers, or 54.7%) were classified as white, 36,281 (6.6%) as black, 3,224 (0.6%) as Asian, 207,679 (38%) as brown, and 513 (0.1%) as Indigenous. Among the mothers, 54,868 (10%) were under the age of 20, 122,941 (22.5%) were between the ages of 20 and 24, and 131,038 (24%) were between the ages of 25 and 29. The marital status of the mothers shows that 214,312 (39.2%) were single and 230,677 (42.2%) were married. As for the educational level of the mothers, 7,277 (1.3%) had no schooling, 76,107 (13.9%) attended elementary I school only, 316,585 (57.9%) attended up to elementary II school, 27,803 (5.1%) attended high school, and 119,113 (21.8%) had higher education.

Table 1 shows the distribution of some sociodemographic variables by the groups of the RTGCS. We can note that the frequency of CD is lower in group 3, where there are the lowest frequencies of mothers under 20 years old,

Table 1 – Sociodemographic variables according to the Robson Ten Group Classification System (n = 546,885).

Group	Frequency of CD (%)	Age <20 years (%)	Higher education (%)	White mothers (%)	T1 ^(a) (%)	Birthweight for gestational age ^(b)		
						SGA (%)	AGA (%)	LGA (%)
1	40.4	25.3	22.7	55.2	88.5	7.9	83.0	9.1
2	72.5	17.4	31.4	60.4	90.8	7.0	80.9	12.1
3	14.2	5.9	10.3	44.2	83.0	6.4	81.0	12.6
4	46.0	4.8	15.9	49.2	87.4	6.1	78.1	15.8
5	84.3	1.9	22.6	58.0	87.4	4.8	76.8	18.3
6	95.9	13.8	39.8	66.8	91.0	9.4	79.5	11.1
7	92.6	2.8	23.3	56.0	87.2	8.4	76.2	15.4
8	90.0	4.7	31.0	59.6	89.6	21.3	76.3	2.5
9	99.0	8.1	21.6	54.7	88.7	10.9	75.9	13.2
10	57.0	11.6	19.2	54.1	84.5	7.5	67.8	24.7

^(a) T1: Onset of prenatal care in the first trimester of pregnancy.

^(b) SGA, AGA, and LGA: small, adequate, and large for gestational age, respectively.

white, with higher education, and beginning prenatal care in the first trimester of pregnancy. The groups with the highest CD frequencies (6 to 9) are also those with the highest frequencies of white mothers and those with higher maternal education. The relationship between these socioeconomic characteristics and the RTGCS groups is better explored in the correspondence map shown in figure 1.

Figure 1 shows the results from the two first dimensions of the MCA, where Dimension 1 (x-axis) seems to represent the characteristics more associated with CD on the left side of the plot and the characteristics more associated with vaginal delivery (VD) on the right side. Dimension 2 (y-axis) seems to express an opposition between younger and older women, so that younger women are represented at the bottom, and older women are represented at the top of the figure. Dimension 1 (horizontal axis) explains 6.74% of the variance in the data, and Dimension 2 (vertical axis) explains 4.17%. Observing the proximity of the points in Figure 1, we can note that the groups 5, 6, 7, 8, and 9 of the RTGCS are described on the left side of the graph, and they are associated with white or Asian women, married, with high school or higher education, AGA, and CD. Reading the graph vertically, we note that groups 5 and 7 (multiparous, singleton) are more associated with women aged 35-39, groups 8 and 9 are more associated with women aged 30-34, and groups 1, 2 and 6 (nulliparous, singleton) is associated with younger mothers.

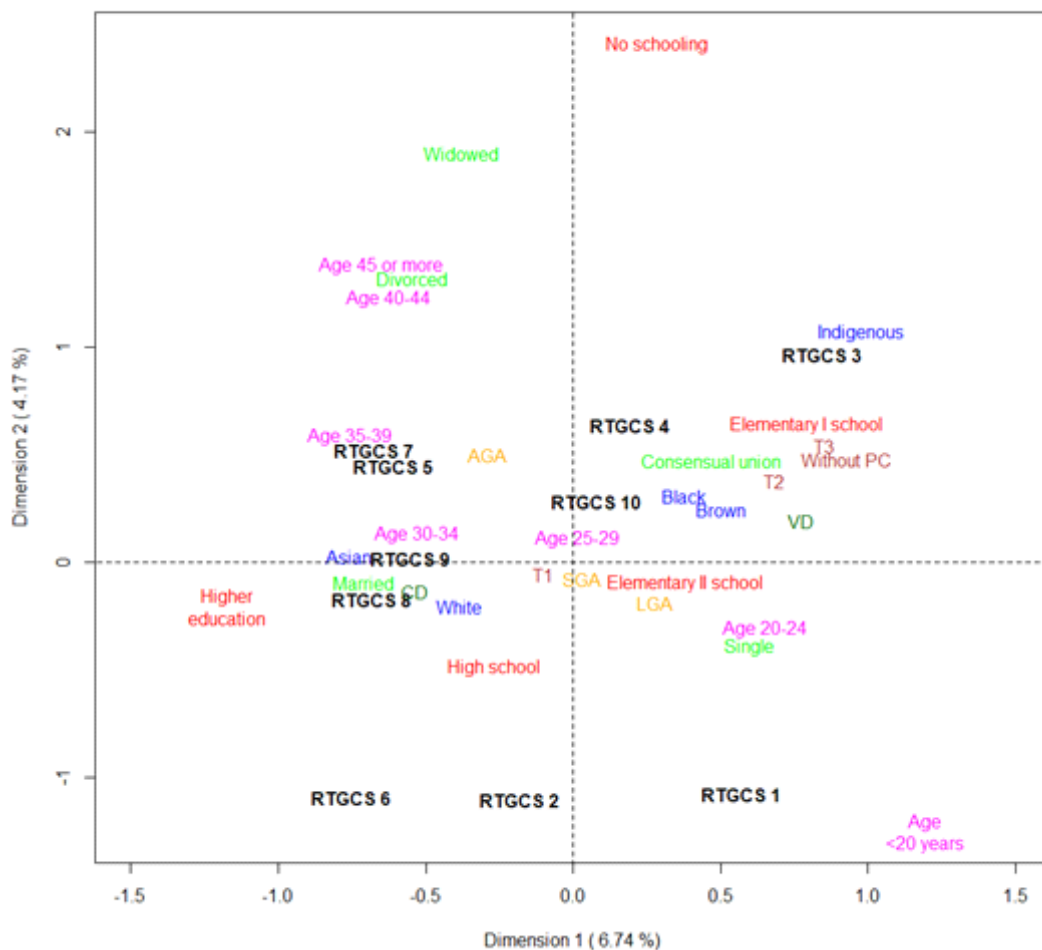


Figure 1 – Correspondence analysis considering the first two dimensions calculated from the data. RTGCS: Robson Ten Group Classification System (numbered from 1 to 10), CD: cesarean delivery, VD: vaginal delivery, SGA: small for gestational age, AGA: adequate for gestational age, LGA: large for gestational age, PC: prenatal care, T1, T2 and T3: onset of prenatal care in the first, second and third trimester, respectively.

Robson Ten Group Classification System (RTGCS): (1) Nulliparous, singleton, cephalic, full-term, spontaneous labour; (2) Nulliparous, singleton, cephalic, full-term, induced labour or prelabour caesarean section; (3) Multiparous, singleton, cephalic, full-term, without a previous cesarean delivery (CD), spontaneous labour; (4) Multiparous, singleton, cephalic, full-term, without a previous uterine scar, induced labour or prelabour caesarean section; (5) Multiparous, singleton, cephalic, full-term, with a previous CD; (6) Nulliparous, singleton, breech; (7) Multiparous, singleton, breech; (8) All multiple pregnancies; (9) Singleton, transverse or oblique lie; and (10) Singleton, cephalic, preterm.

On the other hand, groups 3 and 4 of the RTGCS (multiparous, singleton, cephalic, full-term) are represented on the right side of the graph, and they are associated with black or brown women, with elementary schooling only, single or living in a consensual union, without prenatal care or onset of prenatal care at the second or third trimester, and VD. Among the Indigenous mothers, 30% were classified in group 3 of the RTGCS. Labels representing the birthweight for gestational age (SGA, AGA, and LGA) are close to the centroid of the map, showing low evidence of association with the other variables.

DISCUSSION

The first dimension of the correspondence map (Figure 1) seems to discriminate between characteristics that in Brazil are traditionally associated with high and low social vulnerability. White or Asian women, married and with a higher education level, are represented on the left side of the plot, while black or brown women and those with lower education levels are represented on the right side. Therefore, our results suggest that the frequencies of each group of the RTGCS are associated with the sociodemographic characteristics of the women, and CD and VD are associated, respectively, with high and low social vulnerability. Other studies showed that the highest CD rates in Brazil occur among highly educated, white, older, and pregnant women residing in well-developed regions, which are characteristics of women who predominantly use private healthcare services [9,10].

It should be assured health, sexual, and reproductive rights for women, reducing inequality. Although the literature shows that most Brazilian women prefer a VD, many of them are submitted to a CD at the end of the pregnancy [11,12]. This is often due to a medical indication, who can manage the duration and the time of delivery, obtain financial gains, and hide the lack of training in the conduct of normal deliveries [11-13].

A potential limitation of the study is the possibility of underreporting in the SINASC database, as documented in the literature [14]. Another limitation is the lack of clear information regarding the type of health facilities, so we cannot distinguish between public or private institutions. It is well known that CD in the Brazilian private sector is significantly higher than in the public system, and this information could provide a better understanding of the results obtained from this study [15].

CONCLUSION

In conclusion, our results reinforce the notion that strategies for the reduction of CD should go beyond a biomedical model focused on biological factors and consider the social factors that characterize the living conditions of people. For this reason, new studies on pregnant women's perceptions regarding CD or VD are necessary, including social factors and the preferences, fears, and justifications for their choices.

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