



Relationship between the type of delivery and the epidemiological profile of prenatal and perinatal assistance in a municipality of Minas Gerais


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Abstract

Objectives: to describe the profile of prenatal and perinatal health by correlating it with sociodemographic and clinical conditions, verifying the effectiveness of health actions.

Methods: quantitative, descriptive and retrospective research using data from the Live Birth Information System (Sinasc) of the municipality of Patos de Minas in the period of 2011 to 2015.

Results: between 2011 and 2014 there was a reduction in the rate of vaginal births and a slight increase in 2015, however, the rates of cesarean delivery were higher than recommended by the Ministry of Health. In both types of delivery, most pregnant women attended seven or more prenatal consultations, however, this rate was significantly higher for pregnant women who underwent cesarean section. Maternal age > 35 years was also related to cesarean delivery, however, there was no significant relationship between type of delivery, the gestation time, birth weight and occurrence of maternal death.

Conclusions: during the analyzed period there were more cesarean sections in relation to vaginal deliveries, with no significant change in the number of maternal deaths. A significant association was found between the highest number of prenatal consultations and maternal age > 35 years in pregnant women who underwent caesarean section. Verification of these associations can help in reorienting health practices in the region.

Key words *Prenatal care, Perinatal care, Natural childbirth, Cesarean section*



Introduction

In recent decades, there has been a significant increase in cesarean rates in Brazil. Since 2009, the year in which the number of vaginal birth overcame, for the first time, the number of cesarean delivery, the rate of cesarean delivery continues to rise, accounting for 55.7% of births in 2012. It is important to consider that this reality is not exclusive to Brazil, as it has been happening in some other countries, having as possible causes both the improvement of women's access to surgical procedures and the performance of cesarean by medical indication without technical criteria, that is, indiscriminately. In view of this scenario, it is essential to search for strategies to reduce these high rates,¹ which can occur since the beginning of the perinatal period.

According to the Ministry of Health, the perinatal period begins at 22 weeks, or 154 days of gestation and ends after seven full days of birth, that is, from 0 to 6 days of life, which is called the early neonatal period.² In this context, prenatal care is of great importance to ensure that pregnant women are welcomed throughout the period of pregnancy, guaranteeing them, at the end of pregnancy, a better choice of the type of delivery and the birth of a healthy child. Likewise, postnatal care is extremely important, as it aims to ensure maternal and neonatal well-being after delivery.³

The provision of humanized and qualified services promotes adequate prenatal and postnatal care. This occurs through welcoming conducts and without unnecessary interventions, as well as easy access to health services, which must cover all levels of care: promotion, prevention and health care for pregnant women and newborns. It must also include inpatient and outpatient care.³

To assess the impact of social and economic changes, as well as the advances or setbacks in the availability and quality of health services, it is necessary to monitor the evolution of maternal and child health indicators.

According to Viellas *et al.*,⁴ prenatal care in all regions of Brazil was higher than 90% independent of maternal condition. The study showed that, in Brazil, 75.8% of women start prenatal care before the 16th week of pregnancy and 73.1% attended the minimum of six medical appointment recommended by the Ministry of Health. According to this study, the number of women that started early prenatal care and also attended enough medical appointment was lower in residents of the North and Northeast regions, and around women with low levels of education, women without a partner, with a higher

number of previous gestations and around those who tried to terminate an unwanted pregnancy.

Due to the importance of perinatal care, this study is justified, since it is recommended by the Ministry of Health and has public policies with specific actions directed to prenatal, childbirth and postpartum. Thus, the objective of this study aims to outline the profile of prenatal and perinatal health in a municipality in Minas Gerais between 2011 and 2015, relating them to some sociodemographic and clinical conditions, verifying the effectiveness of these actions.

Methods

This is a quantitative, descriptive and retrospective survey conducted in 2018, whose data were collected from the Live Birth Information System (Sinasc),⁵ made available by the Informatics Department of the Unified Health System (Datapus),⁶ at the electronic address (<http://www.datapus.gov.br>) corresponding to the municipality of Patos de Minas from January 2011 to December 2015.

According to the Brazilian Institute of Geography and Statistics (IBGE), the municipality of Patos de Minas is located in the mesoregion of Triângulo Mineiro and Alto Paranaíba, in the state of Minas Gerais, with an estimated population in 2018 of 150,833 inhabitants.⁷

The study population consisted of pregnant women and newborns. The variables type of delivery, maternal age group, number of prenatal consultations, duration of pregnancy, maternal death and low birth weight were studied.

The sample was stratified by the number of births that occurred in the State of Minas Gerais, with a total of 1,314,477 births, in the period from 2011 to 2015. Of this total, only births that occurred in mothers living in the municipality of Patos de Minas in the same period, that is, 8,789 births if disregarding 3 births whose type was ignored.⁵

As it is a public domain bank, it was not necessary to submit the project to the Research Ethics Committee (CEP).

The statistical analysis consisted of using the GraphPadPrism 7.0 program (GraphPad Software, Inc., San Diego, California, USA) for calculations of frequency, mean, standard deviation, correlations, relative risk, odds ratio and confidence interval. Data were presented in tables.

For media comparisons of maternal deaths and birth frequency (normal and cesarean operations), performed in Patos de Minas from 2011 to 2015,

Shapiro-Wilk normality tests were performed to calculate the *p*-value. As the data displayed normal distribution or Gaussian distribution, the test of Student (unpaired) was used. Values of $p < 0.05$ were statistically assessed.

As correlations between the variables prenatal consultation, duration of pregnancy, birth weight and age at birth were analyzed regarding the type of delivery. The correlation was used using the chi-square tests ($p < 0.05$ considered statistically significant). An analysis of these variables also consisted of calculating the relative risk (RR) using the Koopman asymptotic score and calculating the odds ratio using the Baptista-Pike method, as well as the confidence interval (95%).

Results

In the period between the years 2011 and 2015, 8,789 births were registered in Sinasc, of which 3,403 (38.7%) were vaginal deliveries, while 5,386 (61.3%) were cesarean deliveries.

When analyzing Table 1, there was a reduction in the rate of vaginal delivery in the period from 2011 (41.8%) to 2014 (34.7%) with a decrease of 7.1% in that interval, and comparing the years between 2014 (34.7%) and 2015 (36.7%), an increase of 1.95% is observed. The rate of cesarean section operation showed a gradual increase in the period from 2011 to 2014, decreasing in 2015, reaching a variation of 3.1% comparing 2011 (58.2%) and 2015 (63.3%). The average vaginal deliveries between 2011 and 2015, of 680.6 (± 26.02), is significantly lower ($p < 0.001$) than the average of cesarean delivery, of 1077 (± 117.1), performed in the same period.

Among the variables analyzed, those that showed a significant association with the event under study, that is, the type of delivery, were: number of prenatal care visits (less than 6 or more than 6 visits) and maternal age (less than 35 or over 35 years), according to Table 2.

Considering only vaginal delivery, 1,115 (32.7%) women had up to six prenatal visits, while 2,282 (67.0%) pregnant women attended seven or more care visits during pregnancy, six pregnant women (0.18%) had their number of care visits ignored. As for cesarean delivery, of the total of 5,386 women, 1,053 (19.5%) had up to six visits, while 4,325 (80.3%) had seven or more (RR = 1.489; CI95% = 1.412-1.569; $p < 0.001$) (Table 2). The number of visits by eight (0.15%) women who underwent cesarean section was ignored.

It can be analyzed in Table 2 that of the 3,403

vaginal deliveries, in 435 (12.78%) pregnancies lasted less than or equal to 36 weeks, 2,940 (86.39%) lasted more than 36 weeks and only 28 (0.82%) pregnancies this data was ignored. Regarding cesarean section, the data were similar: 708 (13.15%) before 37 weeks, 4,653 (86.3%) more than 36 weeks of gestation and 25 (0.46%) ignored. It is noted that of the 1,143 premature births, the majority (61.9%) occurred by cesarean section, however, there was no relationship between the type of delivery and the duration of pregnancy (RR = 0.983; CI95% = 0.907-1.062; $p = 0.668$).

Most children who were born vaginally weighed more than 2500g, with $n = 3,060$ (89.9%). Regarding cesarean delivery, most newborns were also born weighing more than 2500g, with $n = 4,806$ (89.2%). According to the World Health Organization (WHO), low birth weight appears to weigh less than 2500g, which was observed in 343 (10.0%) vaginal births and 580 (10.7%) cesarean delivery (RR = 0.955; CI95% = 0.873-0.929; $p = 0.3045$) (Table 2). In three births the type of delivery was ignored, and these, two gestations lasted from 37 to 41 weeks, and in one pregnancy there was no disclosure of this data.

Regarding vaginal delivery, 3,093 (90.8%) mothers gave birth under age of 35 years, with only 310 (9.1%) being above the age mentioned. Performing the same analysis on cesarean operations, it can be seen that 4,354 (80.8%) of mothers were under 35 years old, while 1,032 (19.1%) underwent cesarean section over 35 years old (RR = 1,798; CI95% = 1,627-1,992; $p < 0,001$), verifying that for these women, cesarean section was more prevalent in the analyzed period (Table 2).

The number of deaths by type of delivery in Patos de Minas, in the period from 2011 to 2015, was on average eight (± 2.915) for vaginal deliveries, with a confidence interval of 4.38-11.62, and 9.6 ($\pm 3,782$) for cesarean operations, with a confidence interval of 4.905-14.3.

To check if there is a significant difference between the number of deaths by type of delivery in the period from 2011 to 2015 in the municipality of Patos de Minas, the Student's *t* test was applied, which showed a *p*-value of 0.4751, not being a statistically significant difference. Thus, the two types of births pose similar risks for the occurrence of maternal mortality.

Table 1

Frequency distribution of types of births performed in the municipality of Patos de Minas / MG, 2011-2015.

Year	Vaginal delivery		Cesarean section		Total
	n	%	n	%	
2011	701	41.8	975	58.2	1,676
2012	695	41.4	982	58.5	1,677
2013	669	39.5	1,021	60.4	1,690
2014	640	34.7	1,203	65.3	1,843
2015	698	36.7	1,205	63.3	1,903
Total	3,403	38.7	5,386	61.3	8,789

Source: Sinasc, 2011-2015.

Table 2

Analysis of births according to factors associated with the type of delivery in the municipality of Patos de Minas, MG (2011-2015).

Variables	Total	Vaginal delivery	Cesarean delivery	χ^2	RR	Odds ratio	CI95%	p
Prenatal visit				196.3	1.489	2.007	1.412-1.569	<0.001
Up to 6	2,168	1,115	1,053					
More than 6	6,607	2,282	4,325					
Pregnancy duration (weeks)				0.184	0.983	0.972	0.907-1.062	0.668
<36	1,143	435	708					
>36	7,593	2,940	4,653					
Birth weight (g)				1.054	0.955	0.929	0.873-1.042	0.304
<2500	923	343	580					
>2500	7,866	3,060	4,806					
Mother's age (years)				162.8	1.798	2.365	1.627-1.992	<0.001
<35	7,447	3,093	4,354					
>35	1,342	310	1,032					

χ^2 = Chi-square test; RR = relative risk; CI95% = 95% confidence interval. Source: Adapted from the Live Birth Information System (Sinasc), Department of Informatics of the Unified Health System (Datusus), period 2011 to 2015.

Discussion

The results found in this study showed that there was a decrease in the number of vaginal deliveries in the periods between 2011 and 2014 and an increase in 2015, when compared to the previous year. For cesarean sections, there was a gradual increase in this rate between 2011 and 2014 and a small reduction in 2015. According to data released by Sinasc,⁵ in Minas Gerais the incidence of deliveries in 2015 was 268,305, with 115,964 vaginal deliveries, 151,741 cesarean delivery and 600 ignored. According to WHO, the ideal is a rate of caesarean sections between 10% to 15% for the total population, however in Brazil the rates exceed 70% when considering the private service.⁸

In order to analyze the contribution of obstetric populations, specific to changes in cesarean rates, a study published in 2015 compared the numbers of

cesarean sections in health facilities in 21 countries. In this study, it was identified between two surveys carried out by WHO that cesarean rates increased over time in all nations, except Japan. Although this increase was not new, it was found that the highest rates were registered in the least developed countries. Among these countries, there was support for previous reports of high rates of cesarean sections in Latin American countries, including Brazil.⁹

The increase in the rate of cesarean sections can have negative consequences for maternal health, since the risk of death is ten times higher when this procedure is performed compared to vaginal delivery. In addition, other risks such as bleeding, postpartum infections, pulmonary embolism and anesthetic complications are associated. The performance of cesarean sections also entails risks for newborns, such as respiratory problems, physiological jaundice, iatrogenic prematurity, anoxia,

neonatal mortality and also increases the risk of admission to the Intensive Care Unit.¹⁰

A study published in 2015¹¹ systematically analyzed ecological studies in which they correlated the rate of cesarean sections and their maternal, neonatal and infant outcomes. Studies that did not take into account the need for adjustment in relation to socioeconomic factors, clinical and demographic characteristics of the population, identified a strong inverse relationship between cesarean rates and mortality outcomes, concluding that maternal, neonatal and infant mortality decreased, while the cesarean rate rose above the limit, between 9 and 16%. However, studies that adjusted socioeconomic factors found a weak or nonexistent relationship between these variables. It is also worth mentioning that, regardless of adjustments, cesarean rates above the 9-16% threshold were not associated with decreases in mortality outcomes.

Thus, it is possible to infer that cesarean rates below the threshold, socioeconomic development may be driving the ecological association between cesarean rates and mortality. On the other hand, at rates above this threshold, there is no association between cesarean section and mortality outcomes regardless of the adjustment.¹¹

For Oliveira *et al.*,¹² in relation to the factors that lead to vaginal delivery or cesarean delivery, there are differences when comparing the public sector with the private sector. The authors showed in their study that the rate of cesarean section was higher in the private sector (93.8%) than in the Unified Health System (SUS) (55.5%). In SUS, the preference for cesarean section was related to previous cesarean section (OR = 8.9; CI95% = 4.6-16.9), desire for cesarean section at the beginning of pregnancy (OR=2.0; CI95% = 1.1-3.6), pre-pregnancy overweight / obesity (OR = 1.8; CI95% = 1.1-2.8) and family income per capita higher than one minimum salary (OR = 2.1; CI95% = 1.3-3.4). In the private system, the desire for cesarean section at the beginning of pregnancy (OR = 25.3) and a previous cesarean section (OR = 11.3) were strongly associated with its realization.¹²

In a study by Sakae *et al.*¹³ it was found that the obstetrician's profile has an important decisive factor for the increase in the number of cesarean sections, as they realized that those obstetricians who had more interventionist characteristic performed almost three times more cesarean sections in relation to medical colleagues who chose births with less intervention. Still in this study, the authors identified some clinical factors related to a higher risk of cesarean sections, among them are: non-

cephalic presentation, non-spontaneous progression delivery, twinning, less than three centimeters dilation, gestational pathologies and/or that precede the childbirth, prematurity or post-term.

Another issue to be taken into account is the doctor's belief in the preference of women for cesarean delivery. However, this would be just a way to justify the procedures rate increase, since the real reason would be the low ability of professionals to assist vaginal delivery and the greater convenience and profitability for them.¹⁴

Regarding the number of prenatal visits, at least six visits took place in 32.7% of vaginal deliveries and 19.5% of cesarean sections. On the other hand, seven or more visits took place in 67.0% of vaginal deliveries and 80.3% of cesarean sections. The type of delivery and the number of consultations had a positive association ($p < 0.001$). Pádua *et al.*¹⁵ also observed a positive association between the highest number of prenatal visits and the highest cesarean sections percentage. Pregnant women that have predisposing conditions to cesarean delivery, such as hypertension, preeclampsia and gestational diabetes, have visits more often. Therefore, a health situation of these pregnant women can be the determining factor for a higher frequency of cesarean sections.¹⁵

In a study conducted in a city from Ceará state, with data collected from 124 pregnant patients, of whom 87 (70.1%) underwent vaginal delivery and 37 (29.8) underwent cesarean section, demonstrated that 83.0% of pregnant women went to more than seven visits, while about 15% of pregnant women had between four and six consultations and 1.49% had only two prenatal visits.¹⁶ Carvalho *et al.*¹⁷ found in their study that there is a chance 2.94 times higher for a child with low weight in mothers with less than six prenatal visits. In the study by Silva *et al.*,¹⁶ the researchers did not find a correlation between the type of delivery and the number of consultations, however, a high percentage of pregnant women who had more than seven prenatal visits demonstrates relevance, as it is a means of reduce maternal and neonatal morbidity and mortality. The Ministry of Health, in accordance with WHO, recommends that pregnant women should have at least six prenatal visits, in case of habitual risk. Visits should be monthly up to a 28th week, biweekly between 28 and 36 weeks and once-a-week visit until the delivery.¹⁸

The poor application of prenatal care is related to higher rates of maternal and child morbidity and mortality. Thus, adequate assistance to pregnant women ensures prevention of adverse events for both mothers and babies, in addition to enabling the

identification of risk factors early and enabling safe intervention when necessary.¹⁹

In the present study, regardless of the type of delivery, there was a higher proportion (86.3%) of births with a gestational duration of more than 36 weeks. In contrast, Guimarães *et al.*²⁰ observed in a cross-sectional study using data from Sinasc, referring to births occurred in 2014, that among the group of women undergoing cesarean section there was a higher frequency of premature births and in the group of women undergoing vaginal delivery there was a higher frequency of term pregnancies.

Regarding the types of births and birth weight, there was a higher proportion of newborns weighing more than 2500g for both types of births, however, among newborns with birth weight below 2500g, cesarean delivery stood out (61.9%). Moreira *et al.*²¹ highlighted the relevance between type of delivery and birth weight. In their studies, the odds ratio for low birth weight was 2.3 for cesarean sections.

Regarding the type of delivery and mother's age, it was observed that among pregnant women over the age of 35, cesarean section was more frequent, representing 76.9% (n = 1032) against 23.1% (n = 310) vaginal deliveries. For Meller *et al.*,²² the prevalence of cesarean section was higher among women aged between 36 and 49 years, corroborating the findings of this study. Still in relation to mother's age, Carvalho *et al.*¹⁷ identified in their study that the majority of low weight and premature babies were born to mothers aged between 14 and 25 years. The highest percentage of cesarean sections as the woman's age increases must be conditioned to the health situation of these pregnant women. There is a higher frequency of complications, such as hypertension and other chronic diseases among older pregnant women, which leads to greater chances of having a cesarean section.¹⁵

It is concluded that there was a reduction in the occurrence of vaginal births in the period from 2011 to 2014, and the number of cesarean deliveries increased gradually considering the same period, with the increase in the rate of this type of delivery comparing the year 2013 and 2014 was significantly higher than the other variations, with an increase of 4.86%. In 2015, the last year analyzed in this study, there was an increase in the rate of vaginal births and a decrease in the rate of cesarean operations, which should be seen as positive, even though the rates are far removed from what is recommended by WHO and by the Ministry of Health.

It was also possible to conclude that most pregnant women do attend more than six prenatal visits, as recommended by the Ministry of Health. It was

observed that in women who had a cesarean delivery as outcome, the prenatal care was more appropriate compared to women who had a vaginal delivery, the former having a 13% higher rate of attendance in more than six visits. However, it is worth highlighting the importance of investigating why a significant percentage of pregnant women did not have prenatal care as recommended by the health agency.

For the variable maternal death, there was no statistically significant correlation with the type of delivery, showing that it did not have a significant influence on the mortality of pregnant women.

Thus, although there is a high rate of cesarean delivery, health actions in the municipality of Patos de Minas have provided progress that influenced the fall in cesarean rates and the increase in the number of vaginal deliveries in 2015. It also influenced the offer of prenatal visits in an adequate amount for most of the pregnant women, the expected duration for newborns, for the majority of pregnancies and low maternal mortality associated with complications of childbirth.

The identification of the correlations analyzed in this study allows, within the municipality of Patos de Minas, to recognize the effectiveness of health actions and assist in reorientation of their practices, allowing reformulation of actions that will contribute significantly for further improvement, helping to reduce high cesarean rates and improving health access for pregnant women so these have access to an adequate prenatal perinatal care, in addition to ensure a humanized service in the Unified Health System.

As a limitation of this research, we highlight the absence of comparative parameters of the municipality under study, for some of the evaluated attributes. Periodic assessments of information systems should be integrated into the routine of health surveillance systems. Quality information and updated databases are essential for analyzing health status and making evidence-based decisions. In the present study, the evaluated attributes and the usefulness of the Live Birth Information System ratify the quality and the importance of the information generated by it, in support of public maternal and child health policies.

Author's contribution

Silva EV and Costa MAA performed data collection and analysis, and writing of the article. Almeida KC and Amâncio NFG participated in the data analysis

and writing of the article. Araujo LMB revised the article. All authors approved the final version of the article.

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