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# Characteristics of prenatal care and its association with the place and type of delivery of Peruvian women.

## Características de la atención prenatal y su asociación con el lugar y tipo de parto de mujeres peruanas

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**Abstract**

**OBJECTIVE:** The goal of this study was to establish the association between prenatal care characteristics and the place and type of delivery of Peruvian women.

**MATERIALS AND METHODS:** Retrospective, observational, analytical, cross-sectional study, with a quantitative approach, carried out from analysis of a secondary database of the Demographic and Family Health Survey (ENDES, by its Spanish initials) 2021, in which Peruvian women who met the inclusion criteria participated. The association was evaluated through Poisson's regression.

**RESULTS:** The data of 17,371 Peruvian women was analyzed. Five point five per cent of the deliveries were home births, and 33.75% were C-sections. The probability of home births increased due to the lack of prenatal care ($p < 0.001$; adjusted prevalence ratio [aPR]: 5.23), having received information about their rights ($p < 0.001$; aPR: 1.27), and care entrusted to nurses ($p < 0.001$; aPR: 5.06) or health promoters ($p < 0.001$; aPR: 1.39). C-section deliveries were higher when the first prenatal consultation happened during the first trimester ($p < 0.001$; aPR: 1.22), when they had a blood test ($p = 0.004$; aPR 1.19), they listened to the fetal heartbeat ($p = 0.001$; aPR:1.48), they had a test for syphilis ($p < 0.001$; aPR:1.09), they had a test for HIV ($p < 0.001$; aPR:1.45), they received iron supplementation ($p < 0.001$; aPR:1.18), they received nutritional information ($p < 0.001$; aPR:1.21), and when the person in charge of the control was their doctor ($p < 0.001$; aPR:1.37), or a nursing technician ($p < 0.001$; aPR:1.26).

**CONCLUSION:** Characteristics of prenatal care that determine the type and place of delivery in pregnant women in Peru during 2021 were identified.

**KEYWORDS:** Prenatal care; Childbirth; Women; Maternal health; Home birth.

**Resumen**

**OBJETIVO:** Establecer la asociación entre las características de la atención prenatal y el lugar y tipo de finalización del embarazo de mujeres peruanas.

**MATERIALES Y MÉTODOS:** Estudio retrospectivo, observacional, analítico y transversal, de enfoque cuantitativo, efectuado a partir del análisis de una base secundaria de datos de la Encuesta Demográfica y de Salud Familiar (ENDES) del año 2021 en la que participaron mujeres peruanas que cumplieron los criterios de selección. La asociación se evaluó mediante regresión de Poisson.

**RESULTADOS:** Se analizaron los datos de 17,371 mujeres peruanas. El 5.55% de los partos fueron domiciliarios y el 33.75% culminaron por cesárea. La probabilidad de parto domiciliario se incrementó ante la carencia de control prenatal ($p < 0.001$; razón de prevalencia ajustada (RPa): 5.23), haber recibido información de sus derechos ($p < 0.001$; RPa:1.27) y debido a la atención encargada a enfermeras ($p < 0.001$; RPa:5.06)

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o promotores de salud (p < 0.001; RPa:1.39). La finalización del embarazo mediante cesárea fue mayor cuando la primera atención prenatal se inició durante el primer trimestre (p < 0.001; RPa:1.22), con examen de sangre (p = 0.004; RPa:1.19), escucha de latidos fetales (p = 0.001; RPa:1.48), pruebas para sífilis (p < 0.001; RPa:1.09) y VIH (p < 0.001; RPa:1.45), prescripción de hierro (p < 0.001; RPa:1.18), información para su alimentación (p < 0.001; RPa:1.21), control por parte del médico (p < 0.001; RPa:1.37) o técnico en enfermería (p < 0.001; RPa:1.26).

**CONCLUSIÓN:** Se identificaron lascaracterísticas de la atención que determinaron el tipo y lugar de finalización del embarazo.

**PALABRAS CLAVE:** Atención prenatal; parto; mujeres; salud materna; parto domiciliario.

## BACKGROUND

Maternal mortality is still an unsolved issue because ever day, around 830 women die in the world due to complications during pregnancy, birth, and puerperium. In the 17 Sustainable Development Goals of the United Nations (UN), "Good Health and Wellbeing" aims to reduce the maternal mortality rate to less than 70 cases per every 100,000 newborns. The UN reports that 75% of the maternal deaths are due to obstetric complications, which are treatable and preventable during pregnancy.[1,2] Following this, it is imperative that prenatal consultations comply with high quality standards, given that this enables practitioners to detect and prevent future complications that can end in maternal death.[3]

In recent years, Latin America and the Caribbean have reached high prenatal care coverage rates, with Peru reporting 94.3%,[4] leading to a notorious decline in maternal deaths.[5] Despite this, social contrasts that hinder generalized access to quality health care still prevail. Pregnant women who live in rural areas of the mountains, of the jungle, and in marginalized areas, have more trouble gaining access to prenatal care.[6,7]

Social characteristics not only have an impact on prenatal care, but also in the way the pregnancy ends.[6] One study showed that being poor, coming from mountain or jungle areas, not having prenatal care, or initiating care late in the pregnancy, are all important factors that predispose pregnancies to end in home birth.[8] C-section deliveries tend to increase from 20 to 40% in pregnant women without prenatal education, with a low socioeconomic status, mainly because of misinformation and misconceptions about vaginal birth .[9]

It is possible that there is a triangulation of the association , where social characteristics of the pregnant women are confounders, and the choice of type of delivery is influenced by the quality of the prenatal care. Evidence about this is scarce, and there are no studies in the population that support this with a big enough sample. Thus, the goal of this study was to establish an association between the characteristics of prenatal care, and the type and place of delivery, for Peruvian women who participated in the Demographic and Family Health Survey, during the year 2021.

## MATERIAL AND METHODS

Retrospective, observational, analytical, cross-sectional study, with a quantitative approach. The study was made through an analysis of a secondary database of the Demographic and

Family Health Survey (ENDES, by its Spanish initials) of the year 2021 (http://iinei.inei.gob.pe/microdatos/).

Modules 64 (home characteristics) and 69 (pregnancy, delivery, and puerperium) were used. The participants were women between 15 and 49 years who had at least one child born alive in the past 5 years, and had spent the last night before the survey at their home. The selection was probabilistic in two stages, stratified and independent for each department, according to rural or urban type.

*Study variables*: place of delivery (home or institution), and type of delivery (vaginal or C-section). In both cases, the first category was the one of interest for the analysis .

The characteristics of the prenatal care were evaluated according to its periodicity (no care, less than six consultations, and six or more consultations), the first consultation being during the first trimester of pregnancy, and what it covered: weight and blood pressure measurements, urine and blood tests, auscultation of fetal heartbeat, tests for HIV and syphilis, iron concentrations, and tetanus vaccine. The characteristics of the counseling were also reviewed: information about nutrition during pregnancy, rights of pregnant women, nipple preparation for lactation, lactation techniques, pregnancy complications, and where to go in case of complications. The staff that participated in the prenatal care: doctor, nurse, obstetrician, nursing technician, health promoter, or midwife. All the answers correspond to a self-report of the participant during the execution of the ENDES 2021.

The data of interest was extracted from the modules "1633" and "1629" of the ENDES 2021 and was exported to the software STATA version 17. The calculation of the proportions of the main variables was made considering the complex sampling of the study. The raw association (bivariate), or adjusted (multivariate), between variables was established with the regression test of Poisson, which considered a significant variation a value of $p < 0.05$. The direction of the association was also reported with the adjusted prevalence ratio (aPR), with a confidence interval of 95%.

The report of the distribution of cases was made through maps generated in the software QGIS (geographic information system Quantum GIS). The categorization was done using cutoff quintiles.

The study corresponds to an analysis of a secondary database which is public, so the approval from an ethics committee was not necessary. The data of the participants of the EDNES 2021 is anonymous. The study was reviewed and approved by the research committee of the Obstetrics Professional School of the *Universidad Nacional Mayor de San Marcos*, Peru.

## RESULTS

The study had 17,371 participants who completed the entire information required for the study in the ENDES 2021. The proportion of home birth is seen to be more frequent in the north of Peru in **Figure 1** (**Annex 1**), especially in the regions of Loreto (20.39%), and Ucayali (17.05%). The highest proportion of C-sections was observed in the coast of the country; it was higher in Arequipa (46.29%), and Tumber (46.0%). In general, the proportion of home birth in Peru was of 5.55%, and of C-sections it was 33.75%.

The circumstance of not having prenatal care as a factor that increases the probability of home birth ($p < 0.001$; aPR: 5.23) is shown in **Table 1**. This also reduces the likelihood of a C-section ($p < 0.001$; aPR:0.37), which is also reported with inadequate prenatal care (less than 6 sessions), but to a lesser degree. The initiation of prenatal care during the first trimester of the


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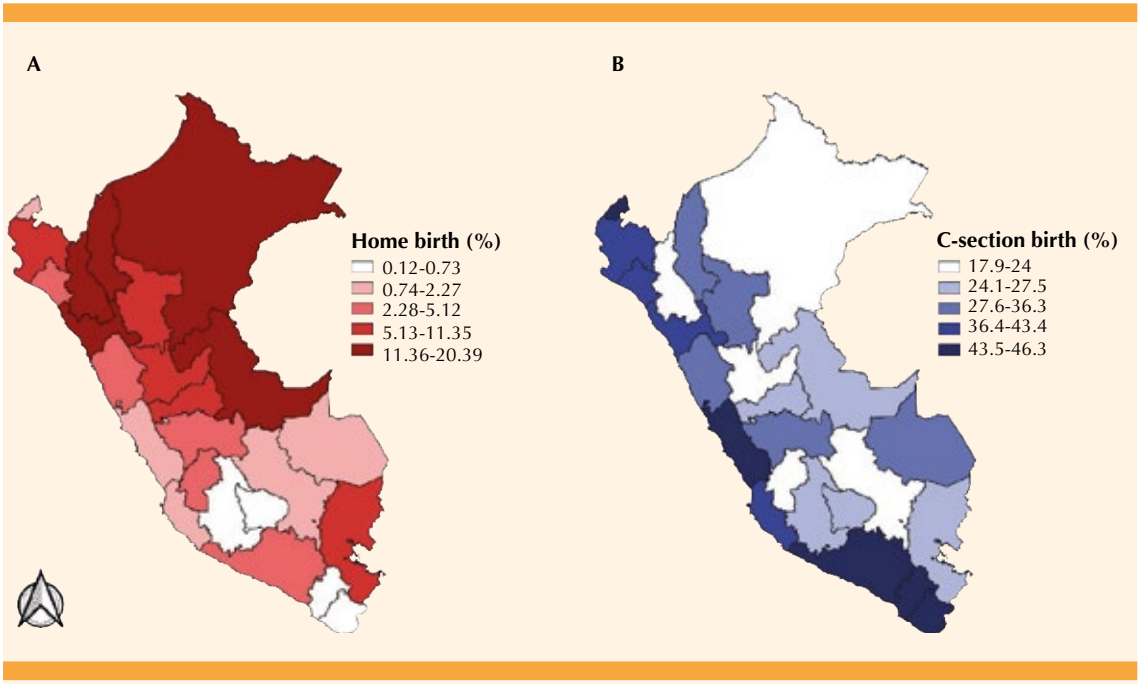



**Figure 1.** Proportion of home birth (A) and C-section birth (B) in Peru, 2021.

**Table 1.** Periodicity and start of prenatal care associated to place and type of delivery in Peruvian women, 2021

| | Birth place (1=Home delivery) | | | Type of delivery (1=C-section) | | |
|---|---|---|---|---|---|---|
| | Raw analysis | Adjusted analysis | | Raw analysis | Adjusted analysis | |
| | p † | p† | aPR [CI95%] | p † | p† | aPR [CI95%] |
| **Prenatal care periodicity** | | | | | | |
| No prenatal control | <0.001 | <0.001 | 5.23 [4.66-5.92] | <0.001 | <0.001 | 0.37 [0.28-0.51] |
| Inadequate (<6) | <0.001 | <0.001 | 1.99 [1.80-2.21] | <0.001 | <0.001 | 0.91 [0.87-0.95] |
| Adequate (≥6) | | *Ref.* | | | *Ref.* | |
| **First prenatal consultation during the first trimester** | | | | | | |
| No | | *Ref.* | | | *Ref.* | |
| Yes | <0.001 | <0.001 | 0.79 [0.72-0.88] | <0.001 | <0.001 | 1.22 [1.17-1.27] |

Prenatal care; rPR: Raw prevalence ratio; aPR: Adjusted prevalence ratio; CI95%: Confidence Interval at 95%; Ref.: Reference category.
† Evaluated by Poisson's regression.

pregnancy decreases the probability of home birth (p < 0.001; aPR:0.79) and increases that of a C-section (p < 0.001; aPR:1.22).

**Table 2** shows the characteristics of prenatal care that are associated with home birth and C-section. Weight measurement (p < 0.001; aPR: 0.27), urine test (p < 0.001; aPR:0.39), fetal heartbeat auscultation (p < 0.001; aPR:0.60), HIV (p < 0.001; aPR:0.40) and syphilis (p < 0.001; aPR:0.69) tests, reduced the probability of home birth. Blood test (p = 0.004; aPR:1.19), fetal heartbeat auscultation (p = 0.001; aPR:1.48), syphilis (p < 0.001; aPR:1.09), and HIV (p < 0.001; aPR:1.45) tests, and iron supplementation (p < 0.001; aPR:1.18) increased the probability of a C-section, while tetanus vaccine (p < 0.001; aPR:0.84) decreased its probability.

**Table 3** shows how counseling can be associated with the place and type of delivery. Having received information related to nutrition during pregnancy (p < 0.001; aPR:0.32), and lactation techniques (p = 0.004: aPR:0.80) reduced the probability of home birth. On the other hand, receiving information related to pregnant women's rights (p < 0.001; aPR:1.27). increased its probability. Receiving information related to pregnant women's rights (p < 0.001; aPR:0.90) and learning lactation techniques (p < 0.001; aPR:0.89) reduced the probability of a C-section, while receiving information related to nutrition during pregnancy (p < 0.001; aPR:1.21) increased its probability.

The association between the staff who participated in prenatal care with the type and place of delivery is shown in **Table 4**; the professional reference was the obstetrician. When a doctor (p < 0.001; aPR:0.27) or nursing technician (p < 0.001; aPR:0.74) participated in prenatal care, the probability of home birth was reduced, and it was increased when a nurse (p < 0.001; aPR:5.06) or a health promoter (p < 0.001; aPR:1.39) participated. The doctor's (p < 0.001; aPR:1.37), or the nurse technician's (p < 0.001; aPR:1.26) participation increased the likelihood of a C-section, and a nurse's (p < 0.001; aPR:0.74) participation reduced it.

## DISCUSION

The environment of deliveries is a relevant matter in maternal care. The availability of adequately trained staff and necessary equipment to provide full care are an imperative to reduce the risk of newborn, and obstetric complications.[10] Even when delivery at institutions is actively promoted, home care is still a concern that requires the identification of the social and sanitary barriers that hinder free and timely access to health services.[11]

A review that analyzed data from low- and middle-income countries found a prevalence of 28% for home birth.[12] The present study found that in Peru, this percentage was considerably lower at 5.5%. However , when comparing this information with African studies,[13,14] a better panorama for mothers is observed, given that percentages there reach up to 29%.

Prenatal care is an important strategy in the frame of maternal and perinatal health, because the services provided by it contribute to the detection and timely treatment of obstetric complications, as well as to guide the patient for a better care of her health.[15] This study found that the risk of obstetric complications is higher when there is no prenatal care or consultations are insufficient (fewer than 6). Along this line, previous studies based on surveys have found that patients with more prenatal consultations have a lower probability of having a home birth.[16,17]

Even though the impact is clear, the relevance of the social and cultural context in maternal care must be highlighted. In a study carried out in a rural area of Ghana, a low rate of hospital deliveries was found, regardless of the high demand


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**Table 2.** Characteristics of prenatal care associated to place and type of delivery in Peruvian women in, 2021

| | Birth place (1=Home birth) | | | Type of delivery (1=C-section) | | |
|---|---|---|---|---|---|---|
| | Raw analysis | Adjusted analysis | | Raw analysis | Adjusted analysis | |
| | p † | p† | aPR [CI95%] | p † | p† | aPR [CI95%] |
| **Weight measurement** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | <0.001 | 0.27 [0.24-0.31] | 0.020 | 0.499 | 0.91 [0.72-1.17] |
| **Blood pressure measurement** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | 0.130 | 0.79 [0.59-1.06] | 0.003 | 0.508 | 1.08 [0.85-1.38] |
| **Urine test** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | <0.001 | 0.39 [0.34-0.46] | <0.001 | 0.622 | 1.02 [0.93-1.11] |
| **Blood test** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | 0.536 | 1.05 [0.89-1.24] | <0.001 | 0.004 | 1.19 [1.05-1.34] |
| **Fetal heartbeat auscultation** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | <0.001 | 0.60 [0.48-0.75] | <0.001 | 0.001 | 1.48 [1.16-1.89] |
| **Syphilis test** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | <0.001 | 0.69 [0.61-0.79] | <0.001 | <0.001 | 1.09 [1.04-1.14] |
| **HIV** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | <0.001 | 0.40 [0.35-0.46] | <0.001 | <0.001 | 1.45 [1.36-1.55] |
| **Iron supplementation** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | 0.848 | 1.01 [0.86-1.18] | <0.001 | <0.001 | 1.18 [1.11-1.26] |
| **Tetanus vaccine (≥1)** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | 0.647 | 1.02 [0.93-1.11] | <0.001 | <0.001 | 0.84 [0.82-0.86] |

rPR: Raw prevalence ratio; aPR: adjusted prevalence ratio; CI95%: Confidence Interval at 95%; Ref.: Reference category.
† Evaluated by Poisson's regression.

**Table 3.** Counseling offered during prenatal care associated to place and type of delivery in Peruvian women, 2021

| | Birth place (1=Home delivery) | | | Type of delivery (1=C-section) | | |
|---|---|---|---|---|---|---|
| | Raw analysis | Adjusted analysis | | Raw analysis | Adjusted analysis | |
| | p † | p† | aPR [CI95%] | p † | p† | aPR [CI95%] |
| **Information about nutrition during pregnancy** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | <0.001 | 0.32 [0.28-0.37] | 0.067 | <0.001 | 1.21 [1.13-1.29] |
| **Information about pregnant women's rights** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | 0.001 | <0.001 | 1.27 [1.14-1.42] | <0.001 | <0.001 | 0.90 [0.87-0.92] |
| **Education about nipple preparation for lactation** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | 0.687 | 1.03 [0.88-1.19] | <0.001 | 0.709 | 0.99 [0.94-0.13] |
| **Education about lactation** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | 0.004 | 0.80 [0.68-0.93] | <0.001 | <0.001 | 0.89 [0.85-0.94] |
| **Information about pregnancy complications** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | <0.001 | - * | 1 | 0.017 | - * | 1 |
| **Information about where to go in cases of complications** | | | | | | |
| No | | Ref. | | | Ref. | |
| Yes | 0.163 | 0.067 | 0.72 [0.50-1.02] | 0.043 | 0.125 | 0.91 [0.82-1.02] |

*Omitted due to collinearity with variable 44 (information about where to go in cases of complications).
rPR: raw prevalence ratio; aPR: adjusted prevalence ratio; CI95%: confidence interval at 95%; Ref.: reference category.
† Evaluated with Poisson's regression.

and ample coverage of prenatal care.[18] Just like in the present study, the findings of another research show that when the beginning of prenatal care is early, the probability of home birth is reduced.[19]

The care given to the delivery process is fundamental to ensure the continuity of a healthy state of the pregnancy, as well as of the newborn. For this reason, this service must be given by an adequately trained and specialized professional.[21,21] In Peru, obstetricians are the professionals who offer the care that strives for complication-free pregnancies and deliveries, with an intercultural and quality approach. However, in consideration


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**Table 4.** Staff who participated in prenatal care associated with place and type of delivery in Peruvian women, 2021

| | Place of delivery (1=Home birth) | | | Type of delivery (1=C-section) | | |
|---|---|---|---|---|---|---|
| | Raw analysis | Adjusted analysis | | Raw analysis | Adjusted analysis | |
| | p † | p† | aPR [CI95%] | p † | p† | aPR [CI95%] |
| **Staff in charge of prenatal care** | | | | | | |
| Doctor | <0.001 | <0.001 | 0.27 [0.21-0.36] | <0.001 | <0.001 | 1.37 [1.32-1.42] |
| Nurse | <0.001 | <0.001 | 5.06 [4.60-5.57] | <0.001 | <0.001 | 0.74 [0.66-0.84] |
| Obstetrician | | *Ref.* | | | *Ref.* | |
| Nursing technician | <0.001 | <0.001 | 0.74 [0.66-0.83] | <0.001 | <0.001 | 1.26 [1.22-1.30] |
| Health promoter | 0.002 | <0.001 | 1.39 [1.18-1.66] | <0.001 | 0.140 | 0.93 [0.85-1.02] |
| Midwife | 0.524 | 0.092 | 1.30 [0.95-1.78] | 0.182 | 0.221 | 1.08 [0.95-1.24] |

rPR: raw prevalence ratio; aPR: adjusted prevalence ratio; CI95%: confidence interval at 95%; Ref.: reference category.
† Evaluated with Poisson's regression.

of this context, it could be inferred that the probability of home birth is higher when the prenatal care is given by nurses or health promoters, who are community agents.[8]

With regard to C-sections, it is clear that the characteristics of prenatal care are determining factors. The probability of a C-section is higher in women who have a late start in their consultations, and it is lower in women with fewer consultations. This data is similar to previous reports made in Uganda[22] and Brazil,[23] where having more prenatal consultations increased the probability of a C-section. A finding that contrasts with the present study is reported by Gedefaw et al.,[24] who found that a C-section was more likely in women who started early with their prenatal control.

The space provided by the prenatal consultation is valuable for the opportunity to counsel, not only the pregnant women but their relatives. The educational content and the obstetric management are needed to ensure an adequate evolution of the pregnancy. A study made in Ethiopia, concluded that the probability of a C-section was higher in women with at least one action or piece of content, performed in consultation.[24] This was also observed in this study, because some of the content, such as fetal heartbeat auscultation, tests for syphilis or HIV, iron supplementation, and nutrition guidance, increase the likelihood of a C-section.

The prenatal care provided by a doctor showed higher probability of a C-section that that showed by prenatal care offered by an obstetrician. While this association is difficult to understand, it could be explained by the behavior of doctors to avoid risks in the intrapartum period, especially in patients with complications or history of complications . Another thing to keep in mind is that unnecessary C-sections are becoming more frequent, not only in private institutions but also in public hospitals,[25] which could be interpreted as an orientation in prenatal consultation counseling to drive preference to C-section deliveries.

This study has limitations derived from the secondary analysis which prevent the detailed exploration of variables that explain the phenomenon of home birth and C-section, as the availability of variables in the database is limited. Despite this, an effort was made to include as many characteristics associated to the study as possible. Because of the retrospective nature of the research, it is possible that there were biases in the recollection of data and the reliability of the answers. Due to the cross-sectional nature of the study, it was not possible to establish a causal relationship between variables.

## CONCLUSION

The proportion of home births reached a 5.5%, and of C-sections a 33.75%. This last percentage is higher than the one suggested by international organizations. The place and type of delivery showed variation according to periodicity of prenatal care, trimester of care initiation, consultations offered, types of counseling, and professional involved.

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