

Prenatal care among adolescent women in the extreme South of Brazil: a secular trend study

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Abstract *This study aims to measure prevalence and evaluate trends for a set of indicators of prenatal care among pregnant adolescents in Rio Grande, Southern Brazil. Between 01/01 and 31/12 of the years 2007, 2010, 2013, 2016 and 2019, was applied a standardized questionnaire in the maternity ward to all parturient women residing in this municipality who had children in the local hospitals. Chi-square test was used to compare proportions and assess trends. Among the 12,645 pregnant women identified, 2,184 (17.3%) were adolescents (<20 years). Of the 36 indicators evaluated, there was a worsening in 2 (pregnancy planning and occurrence of diabetes mellitus), stability in 5 (abdominal ultrasound, immunization against tetanus, possession of the pregnancy card and occurrence of low birth weight and prematurity) and improvement in 29, with emphasis on the reduction in the occurrence of teenage pregnancy, maternal education, clinical and laboratory examinations and adequate prenatal care, rising from 13.8% in 2007 to 52.5% in 2019. There was a substantial improvement in pregnancy and childbirth care, but almost half of the adolescents in the municipality were unable to receive adequate prenatal care, at the same time as the occurrence of unplanned pregnancies increased.*

Key words Prenatal Care, Adolescent health, Pregnancy in Adolescence, Adolescent Mothers

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Introduction

Prenatal care is essential to maternal and child well-being from pre-pregnancy through the first years of life¹. The care provided during this period prevents several health problems, enables early diagnosis and appropriate management, and promotes practices with positive repercussions in the following life stages².

Prenatal care coverage has been improving in Brazil^{3,4}. The latest national surveys show that access to prenatal care and hospital births has become practically universal. They also reveal that 71% of pregnant women begin their visits in the first trimester, complete six or more visits to the health service, and undergo at least one blood/urine test and a pelvic ultrasound⁴. These studies included pregnant women of all ages, with adolescents (<20 years) forming a separate group compared to the others. They are generally disadvantaged, especially compared to those aged 24-29⁴⁻⁷.

Adolescent mothers are more commonly affected by eclampsia, premature placental rupture, puerperal endometritis, and systemic infections^{6,7}. Their children have a higher risk of being born with low birth weight (<2500 g), premature (<37 gestational weeks), and severe neonatal morbidity⁶⁻⁹. Despite this, few studies are addressing prenatal care among adolescents, which prevents the implementation of actions with a more significant potential impact on this population group.

The Rio Grande Perinatal Studies collected primary data on prenatal care received by adolescent mothers from 2007 to 2019. Five census surveys were conducted regularly every three years, using the same methodology and with a respondent rate of around 98%. With these characteristics and, above all, periodicity, this is a unique situation in Brazil.

From this database, we selected 36 critical indicators that include demographic, socioeconomic, and reproductive characteristics, lifestyle habits, gestational morbidity, healthcare during pregnancy and childbirth, and birth conditions of the last child. This article measures the prevalence and evaluates trends for these indicators among adolescents who had children in Rio Grande-RS, over these 13 years.

Methods

This article is nested in the Rio Grande Perinatal Studies, regular three-yearly surveys that aim to

monitor pregnancy and childbirth care services offered in the municipality. The first was conducted in 2007, followed by 2010, 2013, 2016, and 2019.

Rio Grande is a coastal municipality located in the extreme south of Rio Grande do Sul, 310 km off Porto Alegre and 250 km off the border with Uruguay. Its population has grown from 195,000 to 211,000 inhabitants in the last 13 years. Agribusiness and port activities are the basis of its economy. The public health network consists of two hospitals, one entirely public (University Hospital of the Federal University of Rio Grande, HU-FURG) and one non-profit (Santa Casa de Misericórdia de Rio Grande, SC-MRG). Four medical specialty outpatient clinics and 36 PHC units (UBS) exist.

Puerperae had to live in an urban or rural area of the municipality, have given birth between January 1 and December 31 of the years mentioned above, and their child had to have weighed at least 500 grams at birth or with an age of 20 gestational weeks in order to participate in these surveys. This is, therefore, a census. While still in the hospital and within 48 hours after giving birth, these puerperae answered a single, standardized questionnaire divided into blocks, investigating everything from pregnancy planning to the immediate postpartum period.

These questionnaires were administered by four previously trained interviewers in the month preceding data collection through daily visits to the maternity and outpatient care wards, including weekends and holidays.

A physical questionnaire was employed in the surveys conducted between 2007 and 2013. On that occasion, interviewers coded, reviewed and delivered them to the study headquarters. The open-ended questions were coded, reviewed, and entered twice by different professionals in reverse order. This step was performed using the free software EpiData 3.1¹⁰, while the comparison of the databases and subsequent adjustments were performed using Epi Info¹¹.

In the 2016 and 2019 surveys, data entry coincided during the interview using tablets and the REDCap (Research Electronic Data Capture) application¹². At the end of each day, these questionnaires were uploaded to the central server and reviewed. Data were analyzed using the Stata statistical package, version 12¹³. Further details on the methodology of the Rio Grande Perinatal Studies can be found in a specific publication¹⁴.

Although most variables are self-explanatory, some of them require additional clarifi-

cation, namely: household income - amount received by the household residents from any source in the month immediately preceding the interview; low weight - birth weight less than 2500 g; prematurity - gestational age assessed by ultrasound or date of last menstruation of less than 37 weeks; tobacco use - having smoked at least one cigarette per day in the last 30 days; hospitalization - having remained hospitalized for at least 24 hours; and adequate prenatal care - having started in the first trimester of pregnancy, having attended six or more appointments and having undergone at least two tests for HIV, syphilis, and qualitative urine tests. This information was obtained by asking the mother directly and through the Pregnant Woman's Card.

Data analysis included checking the simple frequency for several indicators in each survey, assessing the trend for each variable category, and comparing proportions between categories of the same variable over the period. The trend analysis and the comparison of proportions were performed using the respective chi-square test¹⁵.

Approximately 10% of the interviews were repeated by telephone within two weeks after the interview at the maternity hospital. The Kappa index of agreement ranged from 0.60 (planned pregnancy) to 0.99 (type of delivery), most between 0.72 and 0.91¹⁶.

All research protocols were approved by the Health Research Ethics Committee (CEPAS) of the Federal University of Rio Grande, linked to CONEP, under the following numbers: 2007 survey (Opinion 05369/2006); 2010 (Opinion 06258/2009); 2013 (Opinion 02623/2012); 2016 (Opinion 0030-2015), and 2019 (Opinion 278/2018).

Results

A total of 12,663 births were recorded in the two hospitals in the municipality over these five years, and 12,645 (98%) puerperae were successfully interviewed. Of this total, 2,184 (17.4%) were adolescents (<20 years old).

Most of them were 18 or 19, lived with a partner, were white, had completed at least elementary school, and had a monthly household income of 1 to 2 minimum wages. Approximately 15% had paid work during pregnancy, while 20% of their partners were unemployed (Table 1). Most were primiparous; 10% had smoked before and during pregnancy, and 20% were undergoing treatment for hypertension, diabetes mellitus, or depression (Table 2).

Although a small proportion planned their pregnancy, a significant proportion started prenatal care visits in the first trimester and had six or more visits and several laboratory tests. Most were supplemented with ferrous sulfate, immunized against neonatal tetanus, and attended to by the Unified Health System during prenatal care and delivery time. However, just over a third of them (35.3%) completed the minimally adequate prenatal care, ranging from 13.8% in 2007 to 52.5% in 2019 (Table 3); their children were born almost equally distributed between genders in single births, with 10% and 17% of them having low weight (<2500 g) and premature (<37 weeks), respectively, and with 7% of them being hospitalized immediately after birth. Finally, almost 60% had a Pregnant Woman's Card when admitted for delivery (Table 4).

Except for Table 4, which addresses the child's birth conditions, the trend analysis was statistically significant for almost all indicators evaluated.

Table 5 summarizes the changes observed over these 13 years. Two of the 36 indicators studied deteriorated, 13 remained stable, and 21 improved. Pregnancy planning and diabetes mellitus worsened. The number of residents in the household, the proportion with paid work during pregnancy, the unemployed partner, early initiation of prenatal care, pelvic ultrasound, and tetanus immunization remained practically stable. The other four indicators that remained stable during the period were low birth weight, prematurity, hospitalization of the newborn immediately after birth, and having a Pregnancy Card at the time of birth. Substantial improvement was observed in all other indicators, especially those related to pregnancy and birth care. All pregnant women completed at least one year of schooling with approval and that, during this period, they gained an average of one year of study and delayed birth by three months.

Discussion

This study showed that the profile of pregnant adolescents in Rio Grande do Sul has changed over the past 13 years. They are becoming pregnant at a lower rate and a slightly older age, their education level has improved, the prevalence of smoking has drastically reduced, and they have more prenatal care visits, clinical exams, and laboratory tests, and are planning their pregnancies less. Almost half of them still do not receive adequate prenatal care.

Table 1. Distribution of adolescent postpartum women (<20 years old) according to demographic and socioeconomic characteristics. Rio Grande-RS. 2007-2019.

Characteristic	Perinatal inquiry (%)					2007-2019	
	2007	2010	2013	2016	2019	Variation (%)	p-trend
Mother's age (years)							
11 to 15	3.3 (17)	3.6 (16)	2.8 (13)	2.4 (11)	3.0 (9)	-9.1	0.863
16 and 17	46.3 (239)	42.0 (187)	43.8 (203)	43.2 (197)	40.0 (112)	-13.6	0.130
18 and 19	50.4 (260)	54.5 (242)	53.5 (248)	54.4 (248)	60.1 (182)	+19.2	0.120
Mean (Standard deviation)	17.2 (1.4)	17.4 (1.5)	17.4 (1.4)	17.5 (1.4)	17.5 (1.5)	+3 months	- -
Living with a partner	65.1 (336)	68.1 (303)	75.4 (350)	65.8 (300)	69.3 (93)	+6.5	0.005
Skin color							
White	66.7 (344)	65.6 (292)	59.3 (275)	62.7 (286)	73.3 (222)	+9.9	0.002
Brown	19.8 (102)	23.6 (105)	27.4 (127)	25.0 (114)	18.5 (53)	-6.6	0.006
Black	13.6 (70)	10.8 (48)	13.4 (62)	12.3 (56)	9.2 (28)	-32.4	0.308
Mother's education (years)*							
1 to 4	8.9 (46)	7.4 (33)	7.3 (34)	3.5 (16)	3.0 (09)	-66.3	0.001
5 to 8	59.7 (308)	64.9 (289)	64.0 (297)	65.6 (299)	54.5 (165)	-8.7	0.010
9+	31.4 (162)	27.6 (123)	28.7 (133)	30.9 (141)	42.6 (129)	+35.7	<0.001
Mean (Standard deviation)	7.3 (2.3)	7.4 (2.2)	7.4 (2.2)	7.8 (2.1)	8.1 (2.1)	+0.8 year	- -
Monthly family income in minimum wages (MW)							
<1 MW	19.2 (95)	16.1 (6.5)	5.0 (22)	11.0 (43)	16.4 (47)	-14.6	<0.001
1 to 1.9 MW	43.2 (214)	47.5 (192)	46.9 (206)	49.9 (195)	53.2 (152)	+23.1	0.084
2 to 3.9 MW	29.1 (144)	30.0 (121)	41.2 (181)	31.5 (123)	28.3 (81)	-2.7	<0.001
4+ MW	8.5 (42)	6.4 (26)	6.8 (30)	7.8 (30)	2.1 (06)	-75.3	0.012
Mean (Standard deviation)	1.4	1.5	1.9	1.7	1.4	0.0	- -
Had paid work during pregnancy	13.2 (68)	18.0 (80)	15.7 (73)	17.5 (80)	13.2 (40)	0.0	0.144
Whether the partner was employed/working	24.4 (151)	19.1 (111)	9.5 (66)	31.0 (164)	24.9 (205)	+2.0	<0.001
Number of residents in the household							
Mean (Standard deviation)	3.9 (2.1)	3.7 (2.0)	3.5 (2.0)	3.6 (2.2)	3.6 (2.0)	-7.7	- -
Total (n)	100.0 (516)	100.0 (445)	100.0 (464)	100.0 (456)	100.0 (303)	n=2,184	

*All adolescents had completed at least 1 year of formal schooling.

Source: Authors.

The teenage pregnancy rate in Rio Grande fell by 35.1% from 2007 to 2019, from 20.2% to 13.1%¹⁴. In Pelotas, a neighboring municipality, this drop was 22.8% from 2004 to 2015, falling from 18.9% to 14.6%¹⁷. Brazil dropped 15.8% from 2006 to 2015 (21.5% to 18.1%)¹⁸. Moreover, in Rio Grande, the mean age at birth among adolescents increased by three months during the period, from 17.2 to 17.5 years. Similar results were observed in other Brazilian locations¹⁹, mainly due to the sharp demographic transition combined with the improved education level of mothers and household income¹⁷⁻²⁰.

In Rio Grande, the improvement observed in socioeconomic indicators derives from a very particular situation experienced by the municipality from 2008-9 to 2014-15. During this period, Rio Grande became a base for the assembly of oil platforms. As a result, the job offer was complete, even requiring the search for workers in neighboring municipalities²¹. This situation had an immediate and positive impact, increasing the number of women employed during pregnancy and household family income, which may have prevented school dropouts or even led many to return to their studies due to better

Tabela 2. Distribution of adolescent postpartum women (<20 years old) according to reproductive and life habits characteristics, morbidity and hospitalizations. Rio Grande-RS, 2007-2019.

Characteristic	Perinatal inquiry (%)					2007-2019	
	2007	2010	2013	2016	2019	Variation (%)	p-trend
Parity							
1	76.6 (395)	76.6 (341)	85.6 (397)	78.5 (358)	75.9 (230)	-0.9	
2+	23.4 (121)	23.4 (104)	14.4 (67)	21.5 (98)	24.1 (73)	+3.0	0.002
Previous occurrence of stillborn child	1.2 (06)	0.7 (03)	0.2 (01)	0.7 (03)	0.7 (02)	-41.7	0.519
Spontaneous or induced abortion	8.3 (43)	5.6 (25)	5.0 (23)	4.6 (21)	4.9 (15)	-41.0	0.082
Smoking							
Before pregnancy	27.5 (142)	23.1 (103)	18.1 (84)	12.5 (57)	10.6 (32)	-61.5	
During pregnancy	21.3 (110)	18.7 (83)	14.2 (66)	9.9 (45)	8.9 (27)	-58.2	<0.001
Alcohol consumption during pregnancy	3.5 (18)	4.9 (22)	9.5 (44)	1.3 (06)	1.7 (05)	-51.4	<0.001
Comorbidities during pregnancy							
High blood pressure	17.6 (91)	17.3 (77)	17.0 (79)	16.2 (74)	9.9 (30)	-43.8	0.035
Diabete mellitus	1.6 (08)	0.2 (01)	1.5 (07)	2.2 (10)	4.3 (13)	+168.8	0.001
Depression	15.9 (82)	7.9 (35)	8.0 (37)	3.1 (14)	0.0 (00)	-100.0	<0.001
Multimorbidity (2+)*	29.5 (152)	22.9 (102)	23.4 (109)	20.0 (91)	12.5 (38)	-57.6	<0.001
Maternal hospitalization during pregnancy	14.1 (61)	13.0 (50)	10.8 (42)	12.7 (49)	6.9 (21)	-51.1	0.026
Total (n)	100.0 (516)	100.0 (445)	100.0 (464)	100.0 (456)	100.0 (303)		n=2,184

*Comorbidity: high blood pressure, diabetes mellitus and/or depression.

Source: Authors.

economic conditions¹⁴. In any case, thousands of jobs were lost with the shutdown of these activities in 2016 to the point that the indicators achieved in 2019 were very similar to those observed in 2007; that is, worse.

The prevalence of smoking before pregnancy during this period fell by 61.5% (from 27.5% to 10.6%), while it dropped 58.2% during pregnancy (from 21.3% to 8.9%). Few population-based studies evaluate the prevalence of smoking among pregnant adolescents, especially in the pregestational period, which hinders comparing our findings. However, the lower prevalence of smoking among pregnant women of all ages has been consistent for at least 40 years in different Brazilian locations^{17,22-24}. Considering only adolescents, in Pelotas, it fell from 41% in 1982 to 18% in 2015. In Ribeirão Preto-SP, it dropped from 38% in 1997 to 12% in 2010, while in São Luís-MA, it remained close to 4% in the same period²⁵. However, this decline conceals significant inequalities, but overall proved to be long-lasting and progressive and, in the

case of Rio Grande, very interesting because it was more pronounced among adolescents, the greatest beneficiaries of this reduced exposure^{8,9,25}. Nevertheless, we reiterate that one in 10 of them still smokes, both before and during pregnancy, which should be addressed, even if it requires seeking new anti-tobacco strategies.

A notable improvement was observed in most of the indicators assessed, especially those related to prenatal care. Several studies addressing this topic have identified similar results in different locations^{14,17,24,25} and Brazil^{3-5,23}. The turning point for this betterment was the creation of the Unified Health System in 1989. Since then, several initiatives have been implemented by the public sector, emphasizing the Community Health Workers Program (PACS) and the Family Health Program (PSF) in the mid-1990s, strengthening these programs in the first half of the 2000s, their expansion in 2011 under the name of Family Health Strategy and, finally, the creation of the More Doctors for Brazil Program (PMMB) in 2013²⁶⁻²⁸. These

Table 3. Distribution of postpartum adolescent women (<20 years) according to prenatal care received. Rio Grande-RS, 2007-2019.

Characteristic	Perinatal inquiry (%)					2007-2019	
	2007	2010	2013	2016	2019	Variation (%)	p-trend
Planned pregnancy	27.3 (141)	25.6 (114)	24.1 (112)	26.5 (121)	17.2 (52)	-37.0	0.015
Started prenatal care	95.7 (494)	94.8 (422)	97.4 (452)	98.0 (447)	95.4 (298)	-0.3	0.052
Started consultations in the 1st trimester of pregnancy	55.6 (287)	66.7 (297)	68.5 (318)	65.6 (306)	66.7 (202)	+20.0	<0.001
Attended six or more medical appointments	61.8 (319)	68.8 (306)	79.1 (367)	77.4 (353)	76.9 (233)	+24.4	<0.001
During prenatal consultations, the mother performed (at least)							
2+ HIV serological tests	62.4 (322)	56.5 (251)	73.9 (343)	84.2 (384)	92.4 (280)	+48.1	<0.001
2+ serological tests for syphilis	26.2 (135)	50.3 (224)	70.7 (328)	77.9 (355)	86.8 (263)	+231.3	<0.001
2+ qualitative urine tests	65.9 (340)	67.4 (300)	70.9 (329)	74.3 (339)	79.5 (241)	+20.6	<0.001
1+ Abdominal ultrasound	88.8 (458)	89.7 (399)	95.5 (443)	98.0 (447)	87.5 (265)	-1.5	<0.001
Underwent cytological examination of the cervix	30.2 (156)	50.6 (225)	64.9 (301)	45.4 (207)	46.5 (141)	+54.0	<0.001
Had the breast examined	41.1 (203)	54.3 (229)	47.3 (214)	37.4 (167)	61.4 (186)	+49.4	<0.001
Were immunized against tetanus	77.5 (383)	78.0 (329)	86.1 (389)	74.1 (331)	78.2 (237)	+0.9	<0.001
Received ferrous sulfate	68.6 (339)	82.5 (348)	86.5 (391)	87.0 (389)	83.8 (254)	+22.2	<0.001
The mother started prenatal visits in the first trimester, had six or more visits and at least two HIV, syphilis, and qualitative urine tests	13.8 (71)	31.9 (142)	43.8 (203)	42.8 (195)	52.5 (159)	+280.4	<0.001
Were attended in the public sector (Unified Health System - SUS)							
Prenatal care	79.8 (394)	79.1 (334)	77.4 (350)	82.1 (368)	89.6 (259)	+12.3	
Delivery	91.9 (474)	90.1 (401)	86.6 (388)	93.0 (424)	97.0 (294)	+5.5	0.001
Delivery attended by a physician	84.9 (438)	91.2 (406)	95.9 (445)	95.4 (435)	97.4 (295)	+14.7	<0.001
C-section	40.1 (207)	41.8 (186)	50.4 (234)	35.8 (1.63)	30.7 (93)	-23.7	<0.001
C-section on demand/request	3.1 (16)	6.1 (27)	5.6 (26)	4.8 (22)	3.6 (11)	+16.1	0.166
Episiotomy (n=1,301)	85.8 (265)	81.5 (211)	80.4 (185)	49.1 (144)	26.2 (55)	-69.5	<0.001
Use of forceps (n=1,628)	10.7 (33)	12.4 (32)	8.8 (41)	4.8 (14)	1.0 (03)	-90.7	<0.001
Total (n)	100.0 (516)	100.0 (445)	100.0 (464)	100.0 (456)	100.0 (303)	n=2,184	

Source: Authors.

initiatives prioritized the provision of primary care on the urban outskirts, in rural areas and smaller municipalities, prioritizing those furthest from large urban centers. Rio Grande benefited from all of these programs. Between 2007 and 2019, the number of ESF teams in the municipality hiked from 10 to 26, while the number of PMMB doctors ranged from 6 to 15. This expansion indeed increased the coverage of prenatal care services in the municipality. Thus, 19 of every 20 Rio Grande do Sul adolescents started prenatal care, and all had hospital births during this period. Considering that the respondent rate for our surveys was around 98%, we can suggest that Rio Grande do Sul is close to

universalizing these services, including among adolescents.

However, although it increased 2.8 times (from 13.8% to 52.5%), we should mention that the adequate prenatal care rate among adolescents achieved at the end of the period is still far below the desired in the municipality and worse than other pregnant women, which increased 3.5 times (from 18.1% to 63.2%)¹⁴. Comparison with other studies is hampered by using different criteria and not evaluating this condition only among adolescents. In any case, the adequate prenatal care rate among all postpartum women in Pelotas increased from 41.0% in 1982 to 63.0% in 2015²⁹. It increased from 47.3% in

Table 4. Distribution of newborns of adolescent postpartum women (<20 years old) according to some of their characteristics. Rio Grande-RS, 2007-2019

Characteristic	Perinatal inquiry (%)					2007-2019	
	2007	2010	2013	2016	2019	Variation (%)	p-trend
Gender							
Male	49.2 (254)	55.0 (245)	52.2 (242)	53.5 (244)	50.5 (153)	+2.6	
Female	50.8 (262)	45.0 (280)	47.8 (222)	46.5 (212)	49.5 (150)	-2.6	0.414
Singleton newborns	99.8 (515)	99.1 (441)	98.3 (456)	98.3 (448)	98.7 (299)	-1.1	0.120
Birthweight (grams)							
≤2499	8.3 (43)	10.3 (46)	9.9 (46)	10.8 (49)	12.4 (37)	+49.4	0.477
2500-2999	23.4 (121)	26.5 (118)	23.9 (111)	25.0 (114)	26.5 (79)	+13.2	0.797
3000-3499	44.0 (227)	43.2 (192)	39.4 (183)	39.7 (181)	39.6 (123)	-10.0	0.502
3500-4999	19.6 (101)	18.7 (83)	23.6 (109)	20.0 (91)	18.8 (56)	-4.1	0.345
≥5000	4.7 (24)	1.3 (06)	3.2 (15)	4.6 (21)	2.6 (08)	-46.7	0.029
Mean (standard deviation) grams (g)	3146 (573)	3091 (574)	3149 (540)	3316 (602)	3052 (633)	-94 g	- -
Gestational age (week) (n=1,827)							
20-33.9 (extremely premature)	8.7 (39)	5.9 (22)	7.4 (32)	6.2 (21)	9.8 (23)	+12.6	0.286
34-36.9 (late premature)	11.0 (49)	9.4 (35)	9.5 (41)	9.4 (32)	9.8 (23)	-10.9	0.297
37+ (full term)	80.3 (358)	84.7 (316)	83.1 (316)	84.4 (287)	80.4 (189)	+0.1	0.343
Mean (standard deviation) grams (g)	38.6 (3.6)	38.9 (3.2)	38.7 (2.9)	39.1 (3.3)	38.3 (4.2)	-0.3	- -
Required hospitalization	6.5 (33)	5.4 (24)	7.3 (34)	7.9 (36)	6.6 (20)	+1.5	0.624
Comorbidity at birth * (n=2,184)							
0	76.2 (393)	79.3 (353)	77.2 (358)	79.6 (363)	76.2 (231)	0.0	0.593
1	18.2 (94)	15.3 (68)	16.0 (74)	13.4 (61)	16.2 (49)	-11.0	0.355
2	3.3 (17)	2.9 (13)	3.7 (17)	4.2 (19)	5.0 (15)	+51.5	0.627
3	2.3 (12)	1.5 (11)	3.2 (15)	2.9 (13)	2.6 (08)	+13.0	0.923
Mothers who had a Pregnant Card during hospitalization for childbirth	60.5 (312)	56.4 (251)	68.5 (318)	61.2 (279)	64.0 (194)	+5.8	0.004
Total (n)	100.0 (516)	100.0 (445)	100.0 (464)	100.0 (456)	100.0 (303)		n=2,184

*Comorbidity: low birth (<2500g), preterm (<37 weeks) or hospitalization immediately after birth.

Source: Authors.

1997-98 to 58.2% in 2010⁸ in São Luís-MA. Brazil increased from 15.0% to 71.4% in the same period, consistently improving^{3,5}.

Increasing the proportion of mothers with adequate prenatal care is, therefore, a necessity in the municipality. One possibility with immediate impact would be to build on the countless missed opportunities resulting from prenatal care visits. Table 3, which also reveals that 47.5% of adolescents did not receive adequate prenatal care in 2019, shows that approximately two-thirds of them started prenatal care in the first trimester and that at least three-quarters had 6 or more visits, which highlights some opportunities to increase the supply of clinical examinations and laboratory tests³⁰. Thus, taking advantage of these visits alone would increase

adequate prenatal coverage to 75%, which would be considered remarkable given that it occurs among adolescents.

Two of the 36 indicators assessed worsened. The rate of pregnant women undergoing treatment for diabetes mellitus increased, while the proportion of those who planned their pregnancy declined. The higher number of diabetes cases may have resulted from improved disease detection or greater availability of medication, which led to the search for treatment and, thus, increased the prevalence of this condition since the diagnostic confirmation criterion adopted in these surveys was being under treatment³⁰.

The unplanned pregnancy rate grew 14% among these adolescents, rising from 73% in 2007 to 83% in 2019, while the increase among

Table 5. Summary of changes in indicators related to pregnancy and childbirth care among adolescents in Rio Grande-RS, 2007-2019.

Indicators/Characteristics		Period 2007-2019		
		Improved	Stable	Worsened
Socioeconomics and demographics	Age at birth			
	Living with a partner/husband			
	Number of residents in the household			
	Education			
	Family income			
	Performed paid work during pregnancy			
	Whether the partner was employed/working			
Reproductive life and morbidity during pregnancy	Parity			
	Occurrence of:			
	- Stillbirth			
	- Abortion			
	- High blood pressure			
Life habits/Behavior	- Diabetes mellitus			
	Smoked before and during pregnancy			
Prenatal care	Unplanned pregnancy			
	Prenatal care			
	Started consultations in the 1st trimester of pregnancy			
	Carrying out:			
	- 6+ medical appointments			
	- 2+ serological test for HIV			
	- 2+ serological test for syphilis			
	- 2+ Qualitative urine test			
	- 1+ pelvic ultrasound			
	- Underwent cytological examination of the cervix			
	Had the breast examined			
	Were immunized against tetanus			
	Received ferrous sulfate			
Use of health services and birth assistance	Had adequate prenatal care*			
	Mothers with Pregnant Card during hospitalization/childbirth			
	Use of the Unified Health System during:			
	- Prenatal			
	- Childbirth			
	Hospitalization during pregnancy			
	Birth attended by a doctor			
	Carrying out:			
	- C-section (all)			
Newborn morbidity	- C-section on demand			
	- Episiotomy			
	Use of forceps			
	Low birth weight (<2500g)			
	Pre-term birth (<37 weeks)			
	Hospitalization immediately after birth			

*Started medical visits in the first trimester of pregnancy, attended six or more appointments and undergone at least two tests for HIV, syphilis, and qualitative urine tests.

Source: Authors.

all pregnant women in the same period was 6%, from 63% to 67%³¹. The hike among them oc-

curred in the last two surveys, in 2016 and 2019. Until then, it was approximately 75% for adoles-

cents and just over 60% for all pregnant women. This growth occurred shortly after the interruption of the assembly of oil platforms, when thousands of jobs were eliminated, suggesting a causal relationship between these two events²¹. We did not identify any publication addressing this association. In any case, in an adjusted analysis including all pregnant women in these surveys, a higher prevalence ratio of unplanned pregnancy was found among those with a higher risk of adverse events occurring during pregnancy and childbirth, i.e., adolescents, Blacks, more crowded households, without a partner, lower schooling and household income, higher parity, and smokers³¹.

When interpreting the results of this study, we should bear in mind that most of the responses obtained here were through reports from the mother and not through verification in medical records or health service records, except in the case of the Pregnant Woman's Card, which was copied in full. There are also two other aggravating factors here. First, just over half of them (54%) had the Card with them at delivery, and no more than 30% were adequately filled out. Thus, most of this information derives from the mother's direct response, who may have been affected by forgetfulness, inaccuracy, or even fear of disapproval, i.e., she may have mentioned performing a specific procedure or examination without having done it, especially when this is her responsibility, which would lead to an overestimation of these prevalence figures. Nevertheless, these data are instrumental because the values found, despite a clear improvement, are far below what is desired, which would not affect the recommendations made here. Furthermore, this limitation ensures comparability with other studies because all

those conducted with primary data, especially representative ones, were invariably affected by these problems. Finally, we should underscore the difficulty in comparing and discussing these results with others, given the scarcity of population-based studies including only adolescents.

This study showed that adequate prenatal care among adolescents improved considerably in the municipality during this period. However, there is still a long way to go, as already identified for Brazil regarding maternal and child health³². Increasing the proportion of mothers with adequate prenatal care should be a priority in Rio Grande. Making better use of visit opportunities seems the most straightforward, quickest, and least costly way. We would also suggest adopting a checklist to guide the care provided to each pregnant woman to complete what is missing for each of them promptly. Active home search with the help of a community health worker and social media can also be used to reclaim those missing their appointments. Regarding unplanned pregnancies, which increased 2.3 times more than other types of pregnancy, we recommend holding sensitization campaigns in different types of media and locations, including primary schools, and providing safe contraceptive methods accompanied by guidance in health services. These measures could curb the number of pregnancies among those who do not intend to do so and offer prenatal care with more significant potential to have an impact on the health of the mother and newborn. Reducing maternal and infant morbimortality in Brazil requires providing excellent care to adolescents, whether because they account for almost 20% of all births in the country or because of the burden of diseases to which they are subjected.

Collaborations

AHA Cesar-e-Silva: conceptualization, data analysis, and different drafts of the intermediate and final versions of this article. IF Michelon: assistance in the conceptualization, data analysis, and different intermediate and final versions of this article. LP Marmitt: responsible for data collection and final data analysis, as well as the final review of all sections of the text. JA Cesar: project acquisition, methodology, conceptualization, and assistance in the final draft of the text.

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