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ORIGINAL ARTICLE

Infant mortality rate related to intrauterine hypoxia and perinatal asphyxia in the state of Pará in the period from 1996 to 2019

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Abstract

Objective: To analyze the infant mortality rate due to intrauterine hypoxia and perinatal asphyxia in the State of Pará from 1996 to 2019. **Methods:** A retrospective, descriptive and quantitative study was conducted using data from the DATASUS database from the Ministry of Health. **Results:** The annual infant mortality rate due to intrauterine hypoxia and birth asphyxia in the state of Pará has been decreasing since 1996 to 2019, albeit at a slower rate compared to the national average. The state of Pará has seen a 41% reduction in infant mortality between 1996 and 2019, a smaller decrease compared to the national and North Region indices which were respectively 64% and 72%. Pará was the state in the North region that least managed to reduce infant mortality related to the condition, becoming the holder of the highest infant mortality rate in the North region in 2019. **Conclusion:** It is necessary that public health policies are directed towards improving pre-natal care and childbirth in order to reduce the infant mortality rate due to intrauterine hypoxia and perinatal asphyxia, especially in the more remote regions of the state in order to achieve the same advances obtained elsewhere in the country.

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INTRODUCTION

Perinatal asphyxia, also defined as intrauterine hypoxia and birth asphyxia, is the absence of blood flow or gas exchange in the newborn during peripartum. With less oxygen influx to vital organs, sequelae such as hypoxic-ischemic encephalopathy are caused. Causes of birth asphyxia occur both postpartum, compromising lung ventilation-perfusion, and antepartum, associated with prenatal risk factors such as: changes in maternal hemodynamics, uterine, placental or umbilical cord dysfunctions, or even uterine infections[1,2].

Perinatal death and cerebral palsy are often caused by birth asphyxia, causing suffering for the individual and their family, and great burden on the public healthcare service. Early identification of prenatal risk factors facilitates interventions to prevent hypoxic-ischemic neurological impairment and reduce mortality in newborns. However, more studies are needed to understand causal routes and refine predictors of hypoxia at birth[2,3].

Prenatal care reduces mortality rates in high-risk pregnancies[4-7]. Shah et al.[4] (2020), demonstrated a 1.54 times lower US hospital rate of neonatal mortality in premature births conducted in highly complex hospital centers (level III). Furthermore, in-hospital measures such as the use of corticosteroids in the antepartum period of premature births led to a reduction in peripartum complications, with lower morbidity and mortality rates[5,6].

There were 3.6 million fewer deaths worldwide in children under 5 years of age between 2000 and 2013. With healthcare against infections in infants and children aged 1 to 4 years, there was a sharp drop in mortality. However, neonatal deaths became more prominent in the same period, rising from 37.6% to 43.9%[8].

Global neonatal mortality reduced by more than 50% between 1990 and 2019; however, it remains high and unfairly, affecting developed and underdeveloped countries. In 2019, 2.4 million neonatal deaths were recorded, most of them due to preventable causes, and occurring mainly in the first 24 hours of life. In countries that adopt continuous health care programs for pregnant women, there was a reduction of up to 16% in neonatal deaths and 24% in premature births[7].

In Brazil, more than ten thousand newborns without low birth weight or malformations died in the first week of life due to birth asphyxia. Mortality occurred mainly in the first 24 hours of life, affecting 71% of these newborns. Furthermore, the early neonatal mortality rate has been decreasing, falling from 0.81 per thousand live births in 2005 to 0.65 per 1,000 live births in 2010[9].

The evolution of neonatal mortality rates in Pará must be evaluated and compared with data at regional and national levels, to estimate the investment and resources necessary for care for pregnant women and newborns within the state. Therefore, the study presented here seeks to evaluate the infant mortality rate in those asphyxiated at birth in the state of Pará, comparing it with the rate in the Northern Region of Brazil and the national rate.

METHODOLOGY

In accordance with resolution 466/12 of the National Health Council, as it is a study based on data made available without restriction to citizens in the public domain of DATASUS, it was not necessary to process a draft in the Ethics Committee, nor does it configure the use of the Free Consent and Informed Form (FCIF).

This study is retrospective, descriptive and quantitative in nature, with the objective of analyzing the infant mortality rate due to intrauterine hypoxia and perinatal asphyxia from January 1996 to December 2019 in the state of Pará and comparing it with the states of Northern Brazil, the entire North and Brazil.

The data were obtained from the DATASUS database of the Ministry of Health in the Mortality Information System (MIS) and in the Live Birth Information System (SINASC)[10]. The ICD-10 codes P20 (mortality related to intrauterine hypoxia) and P21 (mortality related to perinatal asphyxia) were used to select infant deaths with intrauterine hypoxia and/or birth asphyxia and live births from the state of Pará, the states of the North Region and the entire country, from January 1996 to December 2019.

These data were organized in Microsoft Office Excel 2010 spreadsheets and transformed into tables to facilitate analysis and interpretation of results. Infant mortality rates (IMR) from intrauterine hypoxia and birth asphyxia were calculated using the equation:

IMR = (number of infant deaths/live births) x 1,000 inhabitants.

Furthermore, the percentage of reduction in IMR between 1996 and 2019 was calculated in each territory analyzed using the following formula:

$$\%\Delta TMI = (\text{initial TMI} - \text{final TMI})/\text{initial TMI} \times 100$$

Subsequently, the results obtained from annual infant mortality rates were analyzed among themselves and compared with the literature. The territories evaluated were the state of Pará, the North Region and its states, and Brazil as a whole.

RESULTS

Annual data on infant mortality due to perinatal asphyxia in Pará are shown in table 1. The number of infant deaths and live births were used to calculate the infant mortality rate due to perinatal asphyxia in Pará, the North Region and its states, and entire country (tables 2 and 3).

Table 1. Child mortality by intrauterine asphyxia and/or perinatal asphyxia in the state of Pará in the period between 1996 and 2019.

Year	Infant mortality rate	Infant deaths	Live births
1996	1.28	127	99,525
1997	1.27	139	109,196
1998	1.33	155	116,964
1999	1.55	197	126,859
2000	1.39	176	126,686
2001	1.71	229	134,009
2002	1.15	156	135,120
2003	1.31	189	143,742
2004	1.48	210	142,243
2005	1.20	173	144,722
2006	1.17	174	149,274
2007	1.39	207	149,157
2008	1.11	167	149,965
2009	1.25	177	141,786
2010	1.26	176	139,208
2011	1.05	148	140,566
2012	1.17	159	136,235
2013	1.02	140	137,634
2014	0.71	100	141,521
2015	0.61	87	141,556
2016	0.95	129	135,701
2017	0.93	127	136,592
2018	0.66	92	139,442
2019	0.76	103	136,064

Source: Datasus.

Between 1996 and 2019, the infant mortality rate related to birth asphyxia decreased by 41% in Pará, 72% in the North Region and 64% in Brazil as a whole (table 4). This decline was recorded in all states in the Northern Region, including Pará (41%), Rondônia (50%), Amapá (80%), Amazonas (88%), Roraima (94%), Acre (94%) and Tocantins (97%), as shown in Table 4.

DISCUSSION

The annual infant mortality rate due to birth asphyxia in the state of Pará has been decreasing from 1996 to 2019; although more slowly, compared to the national average. This reduction is due to the coordination of prenatal care, birth assistance and maternal care conditions, which contribute to the reduction in infant mortality in Brazilian states over the years.

Public policies implemented by the Ministry of Health for prenatal and perinatal care throughout Brazil reduced national infant mortality rates, including in the North Region and the state of Pará. One of these policies was Rede Cegonha ("The Stork Network"), a government project that improved the care for pregnant women and their fetuses in Brazil[9,11,12].

However, even though there was a 41% reduction in infant mortality between 1996 and 2019 in Pará, according to this study, this drop was lower than the national rates and those in the North Region. State face several challenges, such as limited access to quality prenatal care, precarious health infrastructure, insufficient training of healthcare professionals and unfavorable socioeconomic conditions[13]. Furthermore, lack of awareness and lack of education about appropriate practices during pregnancy, childbirth and postpartum also contributes to this situation. It is important to carry out a more in-depth analysis, based on specific epidemiological data, to fully understand the situation and identify other possible causes.[13]

Branco et al.[9] (2020) obtained similar data on the decline in infant mortality in the period from 2005 to 2010 associated with perinatal asphyxia in the North of the country. This slow progress in the management of perinatal risk in the state of Pará suggests a greater need for investments in prenatal and peripartum care for pregnant women in the state.

According to França et al.[13], prenatal care is precarious in many municipalities in the Brazilian federation due to a large proportion of births not being preceded by prenatal consultations. This makes pregnant women vulnerable to undiagnosed complications before the peripartum period, especially in populations in remote regions of Brazil[13].

The situation in Pará and the rest of northern Brazil demonstrates social inequalities in the interior regions, with a lack of prenatal care services and poor access to low and high complexity maternity hospitals, leading to maternal social vulnerability, factors that contribute to children mortality in the state of Pará and the North[13].

CONCLUSION

The infant mortality rate due to intrauterine hypoxia and birth asphyxia in the state of Pará decreased from 1996 to 2019. However, advances during this period were smaller compared to national rates and other states in the Northern Region. Therefore, more studies are needed in Pará to evaluate prenatal access and the quality of care during childbirth for pregnant women; and to correlate this information with deaths due to asphyxia and intrauterine hypoxia.

The study results suggest the need to improve public healthcare policies, focusing on improving prenatal care and childbirth. It is crucial to reduce infant mortality rate due to intrauterine hypoxia and perinatal asphyxia, especially in the most remote regions of the state of Pará, to achieve the same advances achieved in the rest of Brazil.

Table 2. Infant mortality rate due to intrauterine hypoxia and/or perinatal asphyxia in the states of the North region from 1996 to 2019.

Year	Pará	Rondônia	Amapá	Amazonas	Tocantins	Roraima	Acre
1996	1.28	0.90	3.01	3.05	1.39	4.34	2.97
1997	1.27	1.53	3.13	2.51	1.04	2.10	2.17
1998	1.33	1.71	2.69	2.14	1.15	0.24	3.31
1999	1.55	1.60	3.01	1.85	1.52	1.14	1.40
2000	1.39	1.34	2.79	1.67	1.97	0.62	1.37
2001	1.71	1.45	2.43	1.40	1.11	1.15	1.40
2002	1.15	1.70	2.12	0.99	1.79	0.90	0.38
2003	1.31	1.21	1.58	0.82	1.29	0.79	0.62
2004	1.48	1.20	2.03	0.76	1.16	0.93	0.77
2005	1.20	1.32	2.41	0.86	1.47	0.52	0.45
2006	1.17	1.00	2.50	0.80	1.03	0.52	1.08
2007	1.39	1.52	1.74	0.85	0.64	0.73	0.85
2008	1.11	0.56	1.70	0.56	0.78	0.20	0.49
2009	1.25	0.61	1.58	0.66	0.93	0.21	0.92
2010	1.26	1.04	2.51	0.66	0.78	0.31	0.77
2011	1.05	0.72	1.68	0.77	0.69	0.50	0.33
2012	1.17	1.17	1.57	0.48	0.46	0.00	0.35
2013	1.02	0.63	1.60	0.55	0.34	0.74	0.90
2014	0.71	0.80	1.31	0.52	0.37	0.45	0.90
2015	0.61	0.90	0.88	0.62	0.49	0.53	0.57
2016	0.95	0.49	1.19	0.34	0.26	0.18	0.55
2017	0.93	0.54	1.25	0.50	0.41	0.60	0.65
2018	0.66	0.43	0.46	0.36	0.28	0.38	0.70
2019	0.76	0.45	0.59	0.38	0.04	0.27	0.18
Reduction 1996 -2019	41%	50%	80%	88%	97%	93%	94%

Source: Datasus.

Table 3. Mortality rate due to intrauterine hypoxia and/or perinatal asphyxia in Pará, North region and Brazil as a whole from 1996 to 2019.

Ano	Pará	Região Norte	Brasil
1996	1.28	1.89	1.38
1997	1.27	1.73	1.27
1998	1.33	1.66	1.20
1999	1.55	1.67	1.28
2000	1.39	1.54	1.12
2001	1.71	1.56	1.07
2002	1.15	1.22	1.12
2003	1.31	1.15	1.03
2004	1.48	1.23	1.04
2005	1.20	1.14	0.95
2006	1.17	1.09	0.97
2007	1.39	1.18	0.91
2008	1.11	0.88	0.84
2009	1.25	0.99	0.79
2010	1.26	1.07	0.76
2011	1.05	0.90	0.72
2012	1.17	0.87	0.65
2013	1.02	0.83	0.64
2014	0.71	0.68	0.58
2015	0.61	0.64	0.58
2016	0.95	0.67	0.54
2017	0.93	0.74	0.54
2018	0.66	0.52	0.49
2019	0.76	0.52	0.49
Reduction 1996 -2019	41%	82%	64%

Source: Datasus.

Table 4. Difference in the mortality rate due to intrauterine hypoxia and/or perinatal asphyxia in the North region and its states, and in Brazil between 1996 and 2019.

Year	Pará	Rondônia	Amapá	Amazonas	Roraima	Acre	Tocantins	Northern Brazil	Brazil
1996	1.28	0.90	3.01	3.05	4.34	2.97	1.39	1.89	1.38
2019	0.76	0.45	0.59	0.38	0.27	0.18	0.04	0.52	0.49
%ΔTMI*	0.52 (41%)	0.45 (50%)	2.42 (80%)	2.67 (88%)	4.07 (94%)	2.79 (94%)	1.35 (97%)	1.37 (72%)	0.89 (64%)

*%ΔTMI = percentage of infant mortality rate reduction between 1996 and 2019. Source: Datasus.

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