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## ORIGINAL ARTICLE

# Early neonatal deaths associated with perinatal asphyxia in infants $\geq 2500$ g in Brazil<sup>☆,☆</sup>

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### KEYWORDS

Asphyxia neonatorum;  
Early neonatal mortality;  
Meconium aspiration syndrome;  
Infant;  
Newborn;  
Brazil

### Abstract

**Objective:** To assess the annual burden of early neonatal deaths associated with perinatal asphyxia in infants weighing  $\geq 2500$  g in Brazil from 2005 to 2010.

**Methods:** The population study enrolled all live births of infants with birth weight  $\geq 2500$  g and without malformations who died up to six days after birth with perinatal asphyxia, defined as intrauterine hypoxia, asphyxia at birth, or meconium aspiration syndrome. The cause of death was written in any field of the death certificate, according to *International Classification of Diseases, 10th Revision* (P20.0, P21.0, and P24.0). An active search was performed in 27 Brazilian federative units. The chi-squared test for trend was applied to analyze early neonatal mortality ratios associated with perinatal asphyxia by study year.

**Results:** A total of 10,675 infants weighing  $\geq 2500$  g without malformations died within six days after birth with perinatal asphyxia. Deaths occurred in the first 24h after birth in 71% of the infants. Meconium aspiration syndrome was reported in 4076 (38%) of these deaths. The asphyxia-specific early neonatal mortality ratio decreased from 0.81 in 2005 to 0.65 per 1000 live births in 2010 in Brazil ( $p < 0.001$ ); the meconium aspiration syndrome-specific early neonatal mortality ratio remained between 0.20 and 0.29 per 1000 live births during the study period.

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<sup>☆</sup> Study conducted at Sociedade Brasileira de Pediatria, Programa de Reanimação Neonatal, São Paulo, SP, Brazil.

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62**PALAVRAS-CHAVE**

Asfixia neonatal;  
Mortalidade neonatal  
precoce;  
Síndrome de  
aspiração de  
mecônio;  
Neonato;  
Recém-nascido;  
Brasil

**Conclusions:** Despite the decreasing rates in Brazil from 2005 to 2010, early neonatal mortality rates associated with perinatal asphyxia in infants in the better spectrum of birth weight and without congenital malformations are still high, and meconium aspiration syndrome plays a major role.

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## Óbitos neonatais precoces associados à asfixia perinatal em neonatos $\geq 2500$ g no Brasil

**Resumo**

**Objetivo:** Avaliar a taxa anual de óbitos neonatais precoces associados à asfixia perinatal em neonatos de peso  $\geq 2500$  g no Brasil de 2005 a 2010.

**Métodos:** A população do estudo envolveu todos os nascidos vivos de neonatos com peso ao nascer  $\geq 2500$  g e sem malformações que morreram até seis dias após o nascimento por asfixia perinatal, definida como hipóxia intrauterina, asfixia no nascimento ou síndrome de aspiração de mecônio. A causa do óbito foi escrita em qualquer linha do atestado de óbito, de acordo com a Classificação Internacional de Doenças, 10<sup>a</sup> Revisão (P20.0, P21.0 e P24.0). Foi feita uma pesquisa ativa em 27 unidades federativas brasileiras. O teste Qui-quadrado de tendência foi aplicado para analisar os índices de mortalidade neonatal associados a asfixia perinatal até o ano do estudo.

**Resultados:** Um total de 10.675 neonatos com peso  $\geq 2500$  g sem malformações morreu até 0-6 dias após o nascimento por asfixia perinatal. Os óbitos ocorreram nas primeiras 24 horas após o nascimento em 71% dos neonatos. A síndrome de aspiração de mecônio foi relatada em 4076 (38%) dos óbitos. O índice de mortalidade neonatal precoce relacionada à asfixia caiu de 0,81 em 2005 para 0,65 por 1000 nascidos vivos em 2010 no Brasil ( $p < 0,001$ ); o índice de mortalidade neonatal precoce relacionada a síndrome de aspiração de mecônio permaneceu entre 0,20-0,29 por 1000 nascidos vivos durante o período do estudo.

**Conclusões:** Apesar da redução nas taxas no Brasil de 2005 a 2010, as taxas de mortalidade neonatal precoce associadas à asfixia perinatal em neonatos no melhor espectro de peso ao nascer e sem malformações congênicas ainda são altas, e a síndrome de aspiração de mecônio desempenha um importante papel.

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**Introduction**

Recently, the deaths of children younger than 5 years of age have decreased dramatically, with 3.6 million fewer deaths in 2013 when compared with 2000.<sup>1</sup> This reduction is primarily attributed to progress in prevention and treatment of infectious diseases in post-neonatal infants and children aged 1–4 years.<sup>2</sup> With this decrease in infections, neonatal conditions have gained prominence. In 1990, neonatal deaths accounted for 37.4% of deaths in children younger than 5 years of age, compared with 41.6% in 2013.<sup>3</sup> The three leading causes of the 2.9 million annual neonatal deaths worldwide are preterm birth complications (1.0 million), intrapartum conditions (0.7 million), and infections (0.6 million). Intrapartum-related conditions and preterm birth dominate in the early neonatal period.<sup>4</sup>

In 2013, the Maternal and Child Epidemiology Estimation Group reported that intrapartum-related events accounted for 24% of neonatal deaths in the world.<sup>1</sup> Two-thirds of these deaths occurred in South Asia and Africa.<sup>5</sup> High-income countries have a low incidence of

asphyxia-related deaths, at approximately 12%.<sup>6</sup> Conversely, around 740,000–1,480,000 yearly neonatal deaths worldwide occur among infants with birth weight  $\geq 2500$  g; in low- and middle-income countries, most of these deaths are associated with intrapartum asphyxia.<sup>7</sup>

Brazil, the largest South American country, with a population of approximately 200 million and 3 million births per year, has experienced economic and social progress from 2003 to 2013, in which more than 26 million people emerged from poverty and inequality was reduced.<sup>8</sup> The fourth Millennium Development Goal was achieved by the country with a 78% reduction of under-five mortality rate from 1990 (61.5 per 1000 live births) to 2013 (13.7 per 1000 live births).<sup>9</sup> Estimates and uncertainty intervals for early and late neonatal deaths per 1000 live births in Brazil in 2013 were 7.5 (6.6–8.4) and 2.6 (2.4–2.7), respectively.<sup>3</sup> The data compiled by the State Health Departments and reported to the Brazilian Ministry of Health indicated that intrauterine hypoxia and birth asphyxia represented 7% of the basic causes of deaths between 0 and 6 days after birth in 2014.<sup>10</sup>

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