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ORIGINAL ARTICLE

Spatial analysis of neonatal mortality in the state of São Paulo, 2006-2010[☆]

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KEYWORDS

Infant mortality;
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Abstract

Objective: The aim of this study was to identify spatial patterns of distribution of overall, early, and late neonatal mortality rates in São Paulo state.

Methods: An ecological and exploratory study was carried in micro-regions of São Paulo state. Mortality rates per 1,000 live births (LB) were calculated using data on overall, early, and late neonatal mortality in São Paulo between 2006 and 2010; these data were obtained from Information System and Information Technology Department of the Brazilian National Healthcare System (DATASUS). The global Moran's indices (I) were calculated for rates and thematic maps were built with these rates. Micro-regions with a high priority for intervention were identified by the box map. The software TerraView 4.2.1 was used for spatial analysis.

Results: The rates of early and late neonatal mortality were 6.2 per thousand LB and 2.5 per thousand LB, respectively. The global Moran's indexes (I) were $I=0.13$, $I=0.15$, and $I=0.26$ for overall, early, and late neonatal mortality rates, respectively; all global Moran's indices showed p -values <0.05 . Thematic maps showed clusters of micro-regions with high rates located in the southwest and east of the state.

Conclusion: The results presented in this study allow the implementation of policies by health managers, aiming to reduce neonatal mortality.

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[☆]Study conducted at Departamento de Medicina, Universidade de Taubaté, Taubaté, SP, Brazil.

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PALAVRAS-CHAVE

Mortalidade neonatal;
Epidemiologia;
Sistemas de informação
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Análise espacial

Análise espacial da mortalidade neonatal no estado de São Paulo, 2006-2010**Resumo**

Objetivo: Identificar padrões espaciais da distribuição da mortalidade neonatal total, precoce e tardia no Estado de São Paulo.

Métodos: Estudo ecológico e exploratório realizado em microrregiões do estado de São Paulo. Foram obtidos do Departamento de Informações e Informática do Sistema Único de Saúde (Datasus) dados sobre mortalidade neonatal total, precoce e tardia no estado de São Paulo entre 2006 e 2010. Foram calculadas as taxas de mortalidade por 1000 nascidos vivos (NV). Calcularam-se os índices de Moran global dessas taxas e construídos mapas temáticos; foi construído o *Box Map* para identificar microrregiões com alta prioridade de intervenção. A análise espacial foi realizada utilizando o programa computacional TerraView 4.2.1.

Resultados: As taxas de mortalidade neonatal precoce e tardia, foram respectivamente de 6,2/1000 NV e 2,5/1000 NV. Os índices de Moran global (I) foram I=0,13, I=0,15 e I=0,26 para as taxas de mortalidade neonatal total, precoce e tardia, respectivamente, todos com *p*-valor <0,05. Houve aglomerados de microrregiões com altas taxas localizados no sudoeste e leste do estado.

Conclusão: Com os resultados das análises obtidas neste estudo é possível aos gestores de saúde a implantação de políticas para redução da mortalidade neonatal.

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Introduction

Neonatal mortality (deaths between 0 and 27 days of life) is an important health indicator of a population and accounts for approximately two-thirds of infant deaths. It is classified as early when occurring at less than 7 completed days from the time of birth, and late, when occurring after 7 completed days of age, but before 28 completed days. The neonatal mortality rate consists of early and late neonatal mortality rates, with the first representing the main component that reflects the health care provided to pregnant women in the antepartum period, at delivery, and also the care given to the newborn soon after birth and in neonatal units.^{1,2}

Neonatal death is the main component of infant mortality in Brazil and was 9.7/1,000 LB in 2010, higher than in other countries such as the U.S. (4/1,000 LB), Chile (5/1,000 LB), and Canada (4/1,000 LB), among others, as reported by the World Health Organization.^{3,4} In the period between 2001 and 2010, the decrease in neonatal mortality was approximately 25%.⁴

Neonatal mortality rate can be determined by several factors, such as low and extremely low birth weight, prematurity, complex congenital malformations, and neonatal asphyxia, as well as by poor-quality prenatal care, in addition to sociodemographic factors and regional inequities.^{1,2,5-8} However, the maternal causes, the most preventable, are the most frequent underlying causes and the main triggers of neonatal mortality in developing countries.^{9,10} It is also known that most neonatal deaths occur in regions with low income, and that children born in poor regions have a higher risk of death.^{10,11}

The spatial location of health events and the Geographic Information Systems (GIS) have been more frequently used in the public health area.¹² A study on spatial analysis of neonatal death rates performed in Vale do Paraíba allowed for the identification of priority municipalities for intervention.¹³

The neonatal mortality spatial distribution analysis may provide subsidies for actions to improve health care aiming to reduce this mortality rate. Thus, the objective of the present study was to identify spatial distribution patterns of overall, early, and late neonatal mortality in the state of São Paulo during the period of 2006-2010.

Method

This was an ecological and exploratory study with data on neonatal mortality in 63 micro-regions of the State of São Paulo, Brazil, obtained from the Department of Information and Informatics of the Unified Health System (DATASUS)¹⁴ in the period between 2006 and 2010. São Paulo is Brazil's most populous state, with approximately 41 million inhabitants. Data on live births were obtained from the Information System on Live Births (SINASC).¹⁵

A database was created, which included all cases of neonatal death, and the overall neonatal mortality rate was calculated per 1,000 live births, as well as the early neonatal mortality rate (that occurring at less than 7 completed days from the time of birth) and late (that occurring after 7 completed days of age but before 28 completed days), by micro-region of the state of São Paulo. The rates refer to all deaths in the neonatal period in relation to all births in the period of 2006-2010.

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