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ORIGINAL ARTICLE

The effect of air pollutants on birth weight in medium-sized towns in the state of São Paulo[☆]

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KEYWORDS

Low birthweight;
Air pollution;
Logistic regression;
Linear regression

Abstract

Objective: To investigate the effect of air pollution on birth weight in a medium-sized town in the State of São Paulo, Southeast Brazil.

Methods: Cross-sectional study using data from live births of mothers residing in São José dos Campos from 2005 to 2009. Data was obtained from the Department of Information and Computing of the Brazilian Unified Health System. Air pollutant data (PM_{10} , SO_2 , and O_3) and daily averages of their concentrations were obtained from the Environmental Sanitation & Technology Company. Statistical analysis was performed by linear and logistic regressions using the Excel and STATA v.7 software programs.

Results: Maternal exposure to air pollutants was not associated with low birth weight, with the exception of exposure to SO_2 within the last month of pregnancy (OR=1.25; 95% CI=1.00-1.56). Maternal exposure to PM_{10} and SO_2 during the last month of pregnancy led to lower weight at birth (0.28g and 3.15g, respectively) for each $1mg/m^3$ increase in the concentration of these pollutants, but without statistical significance.

Conclusions: This study failed to identify a statistically significant association between the levels of air pollutants and birth weight, with the exception of exposure to SO_2 within the last month of pregnancy.

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[☆]Study conducted at the Department of Medicine of Universidade de Taubaté, Taubaté, SP, Brazil.

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PALAVRAS-CHAVE

Baixo peso ao nascer;
Poluição do ar;
Regressão logística;
Regressão linear

O papel dos poluentes atmosféricos sobre o peso ao nascer EM cidade de médio porte Paulista**Resumo**

Objetivo: Verificar o efeito da poluição do ar sobre o peso ao nascer numa cidade de médio porte paulista.

Métodos: Estudo transversal, com dados relativos a todos os nascidos vivos de mães residentes no Município de São José dos Campos nos anos de 2005 a 2009. Foram obtidos dados do Departamento de Informações e Informática do Sistema Único de Saúde. Os dados dos poluentes do ar (PM_{10} , SO_2 e O_3), as médias diárias de suas concentrações, foram fornecidos pela Companhia de Tecnologia de Saneamento Ambiental. Aplicou-se a regressão linear e a logística para a análise dos dados, realizadas nos programas Excel e STATA v.7.

Resultados: A exposição materna aos poluentes do ar não se associou ao nascimento de crianças com baixo peso, com exceção do SO_2 no último mês de gestação (OR=1,25; IC95% 1,00-1,56). Além disso, a exposição materna ao PM_{10} e SO_2 no último mês levou à diminuição do peso ao nascer (0,28g e 3,15g, respectivamente) para cada $1\text{mcg}/\text{m}^3$ de aumento da concentração desses poluentes, porém sem significância estatística.

Conclusões: Este estudo não permitiu identificar associação estatística entre os níveis de concentração dos poluentes atmosféricos e o peso ao nascer, com exceção da exposição SO_2 no último mês de gestação.

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Introduction

Air pollution is currently one of the main public health problems, affecting the health of human beings, animals, and plants. The rapid technological advance of the modern world has resulted in an increase in the quantity and variety of pollutants eliminated in the atmosphere, affecting the quality of life on the planet.¹ The main air pollutants in cities are particulate matter (PM_{10}), ozone (O_3), sulfur dioxide (SO_2), carbon monoxide (CO), and nitrogen oxides (NO_2).

Exposure to air pollutants has shown to be associated with several deleterious effects to health, even at levels considered safe by environmental legislation.^{1,2} When measuring the concentration of air pollutants in a given location, it can be identified that higher concentrations result in adverse health effects, such as an increase in the number of hospital admissions, increase in mortality, and decreased life expectancy.³ The effects of air pollution on outcomes related to pregnancy have also been considered in some studies.⁴⁻⁶ Among these outcomes is low birth weight (LBW),^{7,8} defined as a live birth weighing less than 2,500g.⁹ The biological mechanisms involved in fetal growth associated with environmental pollution seem related to placental changes, with anatomopathological and morphometric changes,¹⁰ placental infarction,¹¹ and chronic villitis.¹²

A study conducted by Perera *et al* in Dominican and African-American pregnant women aged 18 to 35 years of age who had lived for at least one year in New York, who were nonsmokers without diabetes or hypertension and had negative serology for human immunodeficiency virus, indicated that in the population studied, the fetus and the newborn are more susceptible than adults to toxic environmental substances.¹³

Birth weight is an important determinant of neonatal morbimortality and post-neonatal mortality,¹⁴ and thus is of great importance in public health. Therefore, the World Health Organization (WHO) considers LBW as the single most important factor in child survival. Children with low birth weight are at significantly higher risk of mortality than children with birth weight $\geq 2,500$ g.¹⁵ LBW is observed in 15.5% of all births worldwide.

However, the problem does not occur uniformly among different locations, but rather is related to socioeconomic status. The highest percentage of children with LBW is concentrated in two regions of the world, Asia and Africa, with 27% and 22% of all live births showing low birth weight, respectively.¹⁶ In developed countries, in general the proportion of LBW is between 4% and 6%.¹⁷ In 2008, Brazil had a proportion of 8.3% and the city of São José dos Campos, 9.1%.¹⁸

LBW has been the subject of several epidemiological studies^{4,7,8,15} aiming to identify its risk factors, in an attempt to develop interventions that can reduce these rates and prevent its occurrence. The importance of LBW for public health is determined not only by the subsequent risk of mortality and morbidity, but also by the frequency at which it occurs. In this context, the present study aimed to evaluate the effect of air pollution on birth weight of newborns of mothers living in São José dos Campos, state of São Paulo, Brazil, in the years 2005-2009.

Methods

This was a cross-sectional study of data on all births to mothers living in the city of São José dos Campos in the

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