Correlation between air pollution in São Paulo with hospitalizations in cardiovascular disease patients with COVID-19

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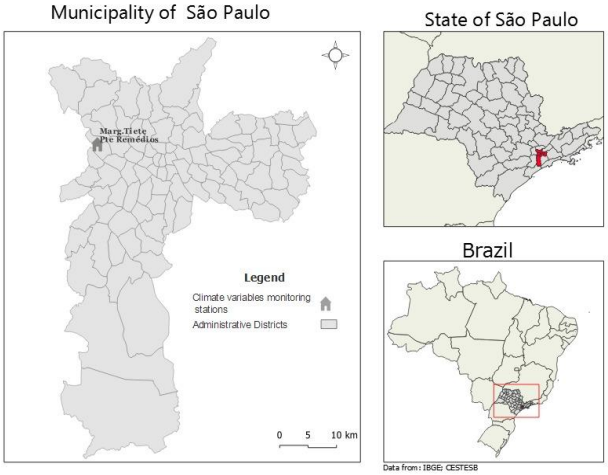
Introduction

Annually, air pollution is responsible for a significant increase in worldwide mortality. In addition to the direct effects of air pollution on different organs and systems, air pollution increases the susceptibility and severity of heart disease.

Another disease that disproportionately affects cardiac patients is viral infection by Sars-Cov-2. Air pollution can preserve the viability of Sars-Cov-2, increase its potential for infection and facilitate transmission through interaction with particulate matter in the air. Therefore, a small increase in long-term exposure to pollutants can lead to a large increase in the mortality rate due to COVID-19, especially in groups already susceptible to the harmful effects of pollution

Based on a short-term assessment, we correlate the daily hospital admissions for COVID-19 in people with cardiovascular disease with the levels of air pollution on the same date.

Figure 1



Methods

Ecological Time Series study was conducted exploring COVID-19 hospitalizations with cardiovascular disease from March to December 2020. The study was carried out in the city of São Paulo, Brazil, using information from COVID-19 hospitalizations obtained by daily bulletins of the State and information on air pollution and climatic variables (PM 2.5, PM 10, temperature and humidity) were obtained from the Environment Company of the State of São Paulo (CETESB) monitoring station of Marginal Tietê represented in the figure 1.

Generalized linear polynomial distributed lag model was used to assess the effect of pollutants in the outcome.

Results

Table 1 shows a descriptive analysis of the variables used in the study, evaluating the average, minimum and maximum value and deviation pattern.

Table 1

	N	Min	Max	Mean	Sd
COVID-19 Cardiopathy	306	3	290	92,85	49,262
Temperature	303	12,50	37,50	26,1552	4,46409
Humidity	302	14	87	40,66	14,628
PM 2,5	298	4	64	19,10	10,908
PM 10	298	5	106	33,47	18,947

The correlation coefficients Spearman's rhô (Table 2) are positive and significant between Covid-19 cases with cardiovascular disease and PM2.5, and PM10.

Table 2

	Covid-19 Cardiovascular	PM2.5	PM10	Temperature	Humidity
Covid-19 Cardiovascular	1,000				
PM2.5	0,115*	1,000			
PM10	0,117*	0,977**	1,000		
Temperature	-0,313**	0,658**	0,453**	1,000	
Humidity	-0,032	-0,506**	-,582**	-0,266**	1,000

* p < 0,05, ** < 0,01

Generalized model, with Poisson distribution even controlling for atmospheric variables showed there is a significant association between hospitalization with diabetes and increase exposure to PM 2.5 and PM10. For this model it is observed that for each increase of a unit of PM2.5 or PM10 it would increase in 0,008 and 0,004 hospitalization with cardiovascular disease.

This result shows that for the interquartile increase of 16.25 µg/m3 PM2.5 and 26µg/m3 PM10 there will be an increase of 14% and 12%, respectively, of new admissions of patients with COVID-19 with pre-existing cardiovascular diseases.

Conclusions

The present results show that there is an association between cases of hospitalization of COVID-19 with diabetes and an increase in air pollution.

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