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Big Data Analysis on the Impact of Air Pollutants on Hospitalization of Respiratory Diseases in Shenzhen, China

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Objective: To explore the relationship between the main air pollutants (PM_{2.5}, PM₁₀, SO₂, NO₂, O₃, CO) and the hospitalization of public with respiratory diseases in Shenzhen, China.

Methods: The data used include daily inpatient data of respiratory diseases in 98 hospitals, daily air pollutant concentration and meteorological and wind direction data of in Shenzhen, China from January 1, 2013 to December 31, 2013. The relationship between the concentration of atmospheric pollutants and the number of hospitalized patients with respiratory diseases was analyzed using a time series generalized additive model (GAM).

Results: In the study of Shenzhen, the generalized additive model including single pollutants showed that there were lag and cumulative effects of sulfur dioxide, nitrogen dioxide, ozone, PM₁₀ and PM_{2.5} on the number of hospitalizations of respiratory diseases. Among them, the moving average value of sulfur dioxide, nitrogen dioxide, PM₁₀ and PM_{2.5} with lag accumulation of 8 days (Lay07) had the largest ER value associated with the number of hospital admissions for respiratory diseases and ozone had the largest ER value at 5 days (Lay04). The generalized additive model including multiple pollutants showed that both PM₁₀ and PM_{2.5} had significant effects on the hospitalization of respiratory diseases, while the effects of SO₂, NO₂, O₃ and CO were not significant.

Conclusion: PM_{2.5} and PM₁₀ are the primary pollutants affecting the hospitalization of public with respiratory diseases in Shenzhen.

Keywords: generalized additive model; time series analysis; atmospheric pollutants; respiratory diseases.