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The effects of climate and air pollutants on heart failure hospitalizations and mortality (CLIMATE-HF Study)

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Background: The data on the effects of air pollution on acute heart failure (HF) in tropical countries is limited. Particulate matter air pollution in Thailand is comparably higher than in other countries in Southeast Asia. The existence of climate and air pollution seasonal variation in our country has never been studied before.

Purposes: We sought to explore the effects of air pollution on HF hospitalizations and in-hospital mortality, including the effects of seasonal variation on HF negative outcomes and the association between air pollutants and hospitalizations of acute heart failure across geographical areas.

Methods: We undertook a retrospective analysis of longitudinal collected clinical data. The Data from 258,539 patients with primary HF admissions and daily pollutant parameters between 2011 and 2015 were collected. Data in daily pollutant parameters including respirable suspended particulates with diameter = 10 µm (PM10), total suspended particles, ozone, carbon monoxide, nitric oxide, sulfur dioxide, air quality index were obtained. Generalized additive regression models and non-linear distributed lag functions were performed.

Results: 440,988 hospital admissions occurred with strong seasonal variation and peaked in winter. Particulate matter = 10 µm (PM10) 2 days prior to admission date was associated with relative risk (RR) (95% confidence interval (CI)) of 1.02 (1.00-1.04, p-value < 0.001) for HF hospitalizations after adjusting with age, sex, respiratory tract infection, acute coronary syndrome and other HF comorbidities (diabetes, hypertension, chronic kidney disease). The association of HF hospitalizations and seasonal PM10 variations was strongest in the Northeastern part of Thailand with RR (95% CI) of 1.04 (1.01-1.05), p-value = 0.005.

Conclusion: HF hospitalizations were associated with preceding PM10 exposure, especially in the area with greater seasonal PM10 variations. Reducing exposure to particulate matter air pollution among those at risk for HF may be the potential prevention of HF hospitalizations.
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