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Effects of particulate matter from 2.5μm to 80μm on emergency hospital admissions for respiratory diseases: a time-series analysis in Heraklion, Crete Island, Greece

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It is of great consensus that air pollution is associated with upper respiratory diseases, such as rhinorrhea, nasal obstruction, cough, laryngospasm, vocal fold dysfunction and lower airway symptoms, such as cough, dyspnea, and wheezing. This study examines the possible association between particulate matter classes with geometric diameter between 2.5μm and 80μm and hospitalization due to respiratory diseases in Heraklion, Crete Island, Greece.

Weekly meteorological variables such as air temperature, humidity, wind speed and mean radiant temperature (Tmrt) were acquired from the meteorological station in Heraklion, Crete Island. A total of 10035 respiratory admissions were registered during the period November 18, 2011 to May 31, 2013, classified by gender. Generalized Additive Models (GAM) were applied to investigate the association of weekly counts of outpatients with respiratory admissions against ambient particulate pollutants, after controlling for possible confounders and nonlinear variations.

The increased levels of all sizes of PMs are related with a significant increase in respiratory admissions. Specifically, PM2.5-5, PM5-10 and PM10-20 appeared to have a positive impact (statistically significantly at $p < 0.05$) on both males' and females' respiratory admissions, while the greater sizes of PMs seem not to have impact on hospitalizations. The GAM modelling explains 68.7% of the data variability, according to the criteria for the chosen degrees of freedom per each smoothed model term.

Regarding the environmental impacts on total respiratory hospitalizations, ambient temperature and human thermal index "Physiologically Equivalent Temperature" seem to have statistically significant association ($p < 0.05$) with males' and females' respiratory admissions. Besides, the findings of the analysis give evidence that weather influences air quality, because the development and dispersion of air pollution are strongly correlated with local patterns of air temperature, humidity and wind.