ASSOCIATIONS BETWEEN PRIMARY AIR POLLUTANTS AND CARDIOVASCULAR MORTALITY IN ATHENS

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EXTENDED ABSTRACT

Air pollution is a major environmental health problem, coming from sources of dust, gases and black smoke, and is generated mainly by human activities but also naturally. When inhaled, air pollutants affect the lung and respiratory tract but can also be taken up and transported by the blood stream throughout the body. The incident of myocardial infraction and the risk of cardio-respiratory death increase on days when particulate concentrations are high. Heart failure episodes may be related to environmental exposure to carbon monoxide and there is some evidence of increased angina episodes, hospital admissions and deaths from cardiovascular disease during episodes of elevated outdoor carbon monoxide concentration.

In this study the associations between black smoke, sulphur dioxide, nitrogen dioxide, carbon monoxide and cardiovascular mortality (CVD) is examined in the Greater Athens Area (GAA). For this purpose the mean monthly values of the mentioned primary air pollutants, coming from eight stations of the Ministry of Environment (Directorate of Air and Noise Pollution Control) for the period 1992-1997, along with the corresponding mean values of CVD, derived from Registry Office of Athens, are analyzed.

The application of Generalized Linear Model with Poisson distribution on the data sets results in significant positive association between black smoke and CVD (b=0.0037, p<0.01), significant positive association between sulphur dioxide and CVD (b=0.0050, p<0.01), not significant positive association between nitrogen dioxide and CVD (b=0.0003, p=0.59) and a remarkable significant positive association between carbon monoxide and CVD (b=0.0380, p<0.01). In particular, interpreting the statistical findings, a ten units increase in black smoke results in a 4% increase of the probability of having an episode of CVD, while the probability of having an episode of CVD rises by 5% after an increase of ten units of sulfur dioxide. The most important is that a ten units increase in carbon monoxide links to a raise of the probability of having an episode of CVD by 38%.
In the process, the application of Fourier analysis on the mean monthly concentrations of the primary air pollutants and the monthly CVD values reveals that the annual variability of the examined parameters (with an exception of nitrogen dioxide) is well given with two harmonic terms explaining above of the 90% of the total variance. Afterwards, the times of maximum for the first and second harmonic terms are estimated.

Key words: Primary air pollutants, cardiovascular mortality, generalized linear models, Fourier analysis, Athens