THE EFFECT OF EXPOSURE TO AIR POLLUTANTS ON INSULIN RESISTANCE MODIFIED BY GENOTYPES OF GSTM1 AND NAT2 IN THE KOREAN ELDERLY ENVIRONMENTAL PANEL STUDY (KEEPs)

Jin Hee Kim, Institute of Environmental Medicine, Seoul National University Medical Research Center, Republic of Korea
Yun-Chul Hong, Institute of Environmental Medicine, Seoul National University Medical Research Center; Department of Preventive Medicine, Seoul National University College of Medicine, Republic of Korea

Background and Aims: Previous studies have found that air pollutants increase cardiovascular outcome and diabetes mellitus (DM) increases the impact of air pollutants on cardiovascular outcome. However, recently, a possibility that DM may be an outcome of air pollution exposures in addition to being an effect modifier for air pollution-associated cardiovascular disease was suggested. Moreover, GSTM1 and NAT2, in relation with detoxification, have been known to affect air pollution-related outcomes. Therefore, in this study, we evaluated the effect of air pollutants on insulin resistance (IR) which is an underlying mechanism of DM and metabolic syndrome and the effect modification by GSTM1 and NAT2 genotypes in the Korean elderly.

Methods: We recruited 560 of aged persons more than 60-years old and obtained blood samples three times during five medical examinations between 2008 and 2010. All ambient air pollutant concentration data (PM10, SO2, O3, NO2, and CO) during the study period were obtained from the Korea National Institute of Environmental Research air quality monitoring system. We measured levels of insulin and glucose in serum in order to assess IR. In addition, the HOMA, an indirect index for the assessment of IR, was calculated using the formula as follows; insulin (U/ml) × [glucose (mmol/l)/22.5]. We also measured urinary level of cotinine as an indicator of smoking amount.

Results: When we estimated the effect of PM10, SO2, O3, NO2, and CO on each insulin resistance index using linear mixed-effect model, PM10, O3, and NO2 were found to be associated with increased insulin resistance indices in the elderly after being adjusted for age, sex, BMI, cotinine level, and outdoor temperature (PM10-glucose, p=0.0002; PM10-insulin, p=0.3308; PM10-HOMA, p=0.0888; O3-glucose, p<0.0001; O3-insulin, p=0.1061; O3-HOMA, p=0.0423; NO2-glucose, p=0.0004; NO2-insulin, p=0.0302; and NO2-HOMA, p=0.0019). The positive relationships between air pollutants and insulin resistance indices were apparent only in subjects with GSTM1 null and NAT2 GG genotypes.

Conclusions: Our study results suggest that PM10, O3, and NO2 affect insulin resistance in the elderly and those with GSTM1 null and NAT2 GG genotypes are susceptible to PM10, O3, and NO2 in respect of insulin resistance.

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