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Association between heavy metal, polycyclic aromatic hydrocarbons and volatile organic compounds exposures and chronic kidney disease markers: Korean National Environmental Health Survey (KoNEHS) 2015-2017

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Objectives: Historical environmental chemicals like heavy metals, polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds (VOCs) have been reported to be associated with chronic kidney disease (CKD). However, epidemiological evidence only limited studies have looked at the association of the PAHs, metals with CKD. This study was conducted to investigate the association between Cd, Pb, Hg, PAHs, and VOCs and CKD in the Korean general population.

Methods: Data from the general South Korean adult population were obtained from the KoNEHS 2015-2017 (n=1,302), whose environmental chemicals measurements, estimated glomerular filtration rate (eGFR) and albumin-to-creatinine ratio (ACR) along with demographic factors were available. Multivariable model analyses were conducted to evaluate the association between chemical exposures and CKD markers. Further analyses were conducted with age, sex, CKD status, and other exposure-related factors stratification.

Results: Mercury, naphthalene and benzene exposures were negatively associated with eGFR and cadmium exposure was positively associated with ACR. The association between urinary mercury concentration and eGFR was stronger in females than in males, but the association between benzene metabolite concentration and eGFR was stronger in males than in females. The negative associations between Hg and VOC exposure and eGFR, and the positive associations between Cd/Pb and PAHs exposure and ACR were significant in the multiple-chemical exposure model.

Conclusions: Among the general adult population, cadmium, lead, mercury, naphthalene, and benzene exposure were identified as risk factors for CKD.