

Oral Communication Abstract

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Novel Approach to the Relation of Environmental Exposure and Kidney Dysfunction: Data analysis from Korean National Environmental Health Survey (KoNEHS) 2015-2017

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Objectives: Forecasting patient outcomes with kidney disease using standard statistical techniques is complex to estimate effects of the environmental chemicals. Herein, we aim to assess risk prediction for kidney disease in the general population using novel methods.

Methods: Serum POPs, serum creatinine or urinary albumin were measured in subpopulation (n=1,266) among the general adult participants from the 3rd Korean National Environmental Health Survey (KoNEHS) (n=3,787). Classification algorithms were used for the prediction of chronic kidney disease (CKD), defined by estimated glomerular filtration rate (eGFR) and urinary albumin-to-creatinine ratio (UACR). In addition, weighted quantile sum (WQS), which provides weights to the components of the mixture, was used to assess multi-pollutant effects.

Results: Of 1,266 adult subjects and 44 variables, including baseline characteristics and laboratory findings, were analyzed for the modeling process. The risk prediction of CKD was presented by machine-learning algorithms using bagging, ridge, lasso, random forest and was compared to conventional algorithms using logistic regression. A decision-tree algorithm was presented that outperformed a conventional method such as logistic regression (AUC 0.653 vs. 0.621). Among various decision-tree models, the lipid-corrected polychlorinated biphenyl congener 153 (PCB 153) was selected as the best predictor of CKD. Because persistent organic pollutants (POPs) accumulate with age, stratification analysis was conducted based on age. In the WQS model, PCB 153 showed the highest weight in its contribution to lower eGFR after adjusting covariates in the middle-aged group (under 50 yrs) (p=0.0135). If subjects with young age (under 50 yrs) were hemoglobin level > 13.25 g/dl, the CKD was predicted as 71.4% in the high serum PCB153 group.

Conclusions: We propose a machine learning-based prediction model. POPs and age were interrelated as notable risk factors for CKD in healthy Korean volunteers.