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Yong-Dae Kim

Chungbuk National University
Korea

Co-Author

Heon Kim

Chungbuk National University,
Korea

Copper-zinc imbalance induces kidney tubule damage and oxidative stress in individuals chronically exposed to cadmium

Cadmium (Cd) is the most potent nephrotoxic heavy metal and chronic exposure to Cd increases the risk for chronic renal disease. However, the relationship between urinary Cd and estimated glomerular filtration rate (eGFR) has been controversial. This study was performed to evaluate the relationship between urinary Cd concentration and renal disease markers, such as eGFR, in a relatively large general population sample. Among the 1,086 volunteers who were enrolled in this study, 856 healthy volunteers who did not have kidney disease were included in the final analysis. Urinary Cd, malondialdehyde (MDA) and N-acetyl-β-D-glucosaminidase (NAG) concentrations were measured, the creatinine-based eGFR was calculated and the relationships between these markers were subsequently analyzed. We found that the urinary NAG and MDA levels were significantly higher and the eGFR was significantly lower in the low Cd group (<2 µg/L) than in the high Cd group (>2 µg/L) in both men and women. Urinary Cd concentration without adjustment for creatinine had a positive correlation with urinary MDA levels and a negative correlation with eGFR. This relationship was relatively stronger in women than in men. This study showed that urinary Cd level was associated with decreased glomerular filtration rate (GFR) in the general population and oxidative stress was likely to act as an intermedialtor in this process. These results suggest that eGFR can be a very good indicator of kidney damage caused by Cd exposure in the general population. Additionally, this study suggests that the use of urinary Cd concentration without adjustment for urinary creatinine rather than the adjusted value may be appropriate in studies evaluating renal function based on Cd exposure.

Biography

Yong-Dae Kim has his expertise in Environmental Epidemiology and passion in finding new biological markers for cadmium exposure. He has taught on Preventive Medicine and Biostatistics in College of Medicine, Chungbuk National University, Republic of Korea.

ydkim@cbu.ac.kr

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