Background/Aims: Cadmium (Cd) is the most potent nephrotoxic heavy metal, with a long biological half-life in human body. This study aimed to assess the effect of environmental Cd exposure on kidney dysfunction.

Methods: The study subjects composed of 687 individuals who reside within 4 km area from a copper refinery plant. We analyzed the concentrations of Cd in blood and urine, renal tubular damage markers [urinary \( \beta \)-2-microglobulin (\( \beta \)-MG), N-acetyl-\( \beta \)-D-glucosaminidase (NAG) activity, and total protein], and kidney function markers [blood urea nitrogen (BUN) and serum creatinine]. Renal dysfunction rates were estimated and compared according to the hematologic and urinary Cd level.

Results: The blood Cd ranged from 0.21 to 16.12 \( \mu \)g/L (geometric mean; 2.56 \( \mu \)g/L) and the urinary Cd, from 0.14 to 22.42 \( \mu \)g/g creatinine (geometric mean; 2.72 \( \mu \)g/g creatinine). The urinary NAG activity was significantly correlated with urinary cadmium level (\( r=0.103, p=0.021 \)). As blood or urinary Cd level increased, the prevalence of renal tubular damage (defined as U-NAG > 11.5 U/g creatinine, or U-\( \beta \)-MG > 300 \( \mu \)g/g creatinine) increased in a dose-response way. The odds ratio (adjusted for age, gender, smoking status, history of diabetes and hypertension) for abnormality of U-NAG according to U-Cd level showed a linear increase, but for U-\( \beta \)-MG was not. The prevalence of abnormal serum creatinine level (defined as serum creatinine > 1.3 mg/dL) was significantly increased in subjects with moderately elevated blood cadmium level (B-Cd; 2.0 ~ 5.0 \( \mu \)g/L) (odds ratio; 9.60, 95% CI; 1.23-75.17). There were significant differences in the prevalence of renal tubular damage and in that of abnormal serum creatinine level between individuals whose blood Cd level was 2.00 \( \mu \)g/L or higher and those with blood Cd level lower than 2.00 \( \mu \)g/L.

Conclusion: These results suggest a possibility that Cd as low as 2.00 \( \mu \)g/L for blood or 2.00 \( \mu \)g/g creatinine for urine can cause renal tubular or glomerular damage.

Keywords: copper refinery plant, cadmium, renal tubular damage