The effect of serum uric acid on renal function

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Objectives: Hyperuricemia is related to increased risk of cardiovascular mortality and mortality. Uric acid is associated with activation of renin-angiotensin system, oxidative stress, and inflammation. However, the effect of uric acid on renal function was controversial.

Methods: Among the 56,367 adult participants who underwent health check-ups during 2004-2017, we included 16,695 participants with estimated glomerular filtration rate (eGFR) ≥60 ml/min/1.73m² and repeated measurements of uric acid and eGFR. We divided participants into sex-specific quartile groups according to the baseline serum uric acid level. The decline of renal function aggravation was defined by the decrease in eGFR by more than 25%.

Results: The average age of the participants was 46.7±12.5 years, baseline eGFR was 91.1 ± 13.7 ml/min/1.73m², and 52.5% were male. During 54.3± 37.5 months of follow up period, the decline of renal function was the highest in the highest quartile of serum uric acid (0.9%, 1.0%, 1.4% and 1.7%; lowest, second, third, and highest quartiles, respectively; P=0.002). The development of chronic kidney disease (CKD) (eGFR <60 ml/min/1.73m²) was the highest in the highest uric acid group (0.7%, 0.6%, 1.2% and 2.5%; lowest, second, third, and highest quartiles, respectively; P<0.001). The multivariate cox regression analysis showed that risks of hypertension and diabetes development were significantly increased in the third and highest quartiles (P<0.001). The risks of decline in renal function were significantly higher in the third (RR, 2.280; 95% CI 1.468-3.542) and highest quartile (RR, 2.982; 95% CI 1.910-4.656) compared than the lowest quartile. The participants with highest quartile showed 2.322-fold risk elevation of CKD development (95% CI 1.486-3.630).

Conclusions: The decline of renal function significantly increased in participants with higher baseline uric acid levels. Serum uric acid levels were associated with the development of hypertension, diabetes, and CKD.