

24-hour versus spot urinary sodium and potassium measurements in adult hypertensive patients: a cohort validation study

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BACKGROUND: Sodium chloride intake is correlated with the development of hypertension, and cardiovascular morbidity and mortality. The principals laid out by Guyton suggest that the 24-hour urinary sodium excretion reflects sodium ingestion over the same period. However, 24-hour urine collections are arduous to collect, so many centres use spot urinary measurements instead. We decided to compare a number of spot urinary electrolyte variables to matched 24-hour urinary measurements.

METHODS: We examined a cohort of 419 hypertensive patients from the UCL Centre for Nephrology Complex Hypertension Clinic. 77 patients had matched and complete 24-hour and spot urinary and serum biochemistry to examine.

We compared the spot and 24-hour urinary; sodium concentration, Na/Cr ratio, FENa, Kawasaki and Tanaka estimated sodium excretion as well as the potassium concentration, K/Cr ratio, Kawasaki and Tanaka potassium excretion.

RESULTS: Our cohort was 58% male and the median age was 41 years (IQR: 34-53.75). The 24-hour and spot urinary Na concentrations were moderately correlated (Spearman $r=0.4633$, $p<0.0001$). The 24-hour and spot urinary Na/creatinine ratios were weakly correlated (Spearman $r=0.2625$, $p=0.0194$). The 24-hour and spot FENa results showed a weak negative correlation (Spearman $r=-0.222$, $p=ns$). The 24-hour sodium excretion and the Kawasaki derived spot urine sodium excretion were moderately correlated (Spearman $r=0.3118$, $p=0.0052$). Bland-Altman (BA) analysis showed poor agreement between all tests.

The 24-hour and spot urinary potassium concentrations were very poorly correlated ($r=0.1158$ $p=ns$). The 24-hour and spot urinary K/creatinine ratios were weakly correlated ($r=0.47$ $p<0.0001$). 24-hour and Kawasaki and Tanaka estimated potassium excretions were much better correlated ($r=0.58$ $p<0.0001$).

CONCLUSION: Spot urinary measurements of sodium give a very poor understanding of the naturesis occurring over the same 24-hour period. The Kawasaki and Tanaka equations for the estimation of the 24-hour sodium excretion showed a much lower correlation than previously reported and should be used with caution. The Kawasaki and Tanaka estimated potassium excretions showed much better correlation with 24-hour potassium excretion.