Estimation of 24-Hour Protein Excretion in Chronic Kidney Disease Patients by Analysing the Protein to Creatinine Ratio of Four Timely Urine Samples

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Measurement of protein excretion in a 24-hour urinary collection is the gold standard method for the quantification of proteinuria in kidney disease patients with various aetiologies. The aim of this study was to evaluate which spot urine protein to creatinine ratio (UPCR) could be a reliable alternative to 24-hour urinary total protein (24UTP) estimation by analysing four daytime urine samples of patients with chronic kidney disease (CKD).

Forty eight CKD patients (28 males and 20 females) with nephritis and high proteinuria (>1g/L for 24 hours and GFR> 45 ml/min/1.73m^2) attending the Nephrology Unit were selected for the study. Four daytime urine samples namely early morning, 7am - 10 am, 10 am-4 pm and before parting to bed were collected along with the 24 hours urine sample. Urine protein and creatinine levels were measured by using turbidimetry and modified Jaffe methods. The best correlation between UPCR and 24UTP was calculated. The linear regression, central tendency and dispersion were also established and the Friedman test was used to evaluate significant difference among UPCR levels of 4 daytime urine samples.

The correlation coefficient (r) between 24UTP and spot UPCR in the study population were: early morning 0.81 ($P < 0.001$); 7am - 10 am 0.64 ($p < 0.001$); 10am-4pm 0.66 ($p < 0.001$); and before parting to bed 0.792 ($p < 0.001$). Early morning spot urine sample showed the highest linear association whereas the 7am-10 am and 10 am-4 pm show lower associations compared to other two spot urine samples. Highest and lowest median of UPCR were 7 am -10 am and before the bed respectively. Highest dispersion of UPCR reported in 10 am-4 pm and the distribution of before bed is somewhat skewed to right.

This study concludes that the protein to creatinine ratio in early morning urine sample is an accurate, convenient, and reliable method to estimate the 24 hours total protein in urine in study population. The other three urine samples, namely, 7am - 10 am, 10 am-4 pm and before departing to bed, can also be used for the estimation of 24-hour protein ($p<0.001$).

Partially funded by South Asian Clinical Toxicology Research Collaboration