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Clinical Utility of Random Spot Urine Protein to Creatinine Ratio Modified by Estimated Daily Creatinine Excretion in Children

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Background: The spot urine protein to creatinine ratio (UPCR) has been widely used in predicting a 24-hour urine protein excretion. Patients with low daily urine creatinine excretion might lead to overestimation of the 24-hour urine protein by UPCR. The aim of this study was to predict the 24-hour urine protein using UPCR adjusted by estimated urinary creatinine excretion rate (UCr) in children.

Methods: This study included 443 children whose 24-hour urine protein and random UPCR were measured concomitantly. Estimated 24-hour creatinine excretion was calculated by three previously existing equations. One equation for adult (Cockcroft-Gault formula) and two equations for children (Ghazali-Barratt and Hellerstein equation) were used. Correlation was accessed between estimated UCr and measured UCr. We estimated the 24-hour urine protein excretion from measured the UPCR by multiplying the estimated UCr. Results were compared with a 24-hour urine protein excretion.

Results: The patients' mean age was 9 years, 46% were male. A strong correlation was found between a measured UCr and estimated UCr, especially, in the equation of Cockcroft ($r = 0.845$, $P < 0.001$). Cockcroft equation showed less bias (mean difference [measured-estimated UCr] 5.8%) and moderate precision (estimated UCr within 30% of measured UCr among 81%). There were strong correlation between UPCR and 24-hour urine protein ($r = 0.812$, $P < 0.001$), and correlation was improved after multiplying the UPCR by the estimated UCr ($r = 0.855$, $P < 0.001$). The percentages of UPCR multiplying by estimated UCr within 15% and 30% of 24hr urine protein excretion were 23% and 47%, respectively.

Conclusion: The spot UPCR multiplying by the estimated UCr can improve the accuracy of prediction of estimating 24-hour urine protein in children.

Keywords: 24-hour urine protein, Proteinuria, Spot urine protein-to-creatinine ratio