METHOD VALIDATION AND ASSESSMENT OF MODELS TO ESTIMATE 24-HOUR URINARY SODIUM FROM SPOT URINE SAMPLES

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Background:
The gold standard for estimating the sodium intake in a population level is the 24-hour urine collection. In spite of being the gold standard, the method has its limitations. Several studies were conducted to correlate urinary sodium concentration based on 24-hour and spot urine collections. As a result, models such as Kawasaki and Tanaka use spot urine to estimate sodium concentrations.

Objectives:
The study aimed to validate the method for determining urinary sodium from the 24-hour and spot urine sample. Assessment of Kawasaki and Tanaka models for the estimation of 24-hour urine was undertaken.

Materials and Methods:
Urine samples (24h and spot) for the conduct of method validation were collected from a volunteer. Urine sodium was determined using Atomic Absorption Spectroscopy and urine creatinine was measured using Cobas Clinical Analyzer. After method validation, urine samples, both 24-hours and three (morning, afternoon and evening) spot urine samples were collected from 78 adult participants aged 21 to 58 years, which was assessed using Kawasaki and Tanaka models. Results of analysis of urine samples were evaluated using paired t-test.

Results and Findings:
For method validation, precision as repeatability was conducted, (n=10 days) for urine sodium that gave a Horwitz Ratio (HorRat) value of 0.4643 for spot urine and 0.4747 for the 24-hour sample. For urine creatinine, HorRat was 0.1046 and 0.1648 for spot and 24-hour urine respectively. Precision as intermediate was performed, (n=7days) for urine sodium and has a HorRat value of 0.2843 (spot), 0.3175 (24-hour) and for urine creatinine 0.4280 (spot), 0.4724 (24-hour). Accuracy of the method, was determined using a standard reference material (SRM) 2668 level 1 and 2 for urine sodium with means 1798.18 mg/L and 1784.71 mg/L, respectively, both within the acceptable range. Moreover, Precinorm and Precipath were used as reference materials for urine creatinine, with values within the range 96.46 mg/L and 49.28 mg/L respectively. Both models Tanaka and Kawasaki showed significant difference against the 24-hour urinary sodium with all the computed p-value less than the set p-value 0.05. With Tanaka model, three spot urine samples gave a p-value of <0.05. On the other hand, with Kawasaki model, all spot urine samples gave a p-value of 0.0000.

Conclusion and Recommendations:
The significant differences of the results can be accounted for variability of sodium consumption of the participants and the assurance of completeness of the 24-hour urine. To further assess the results, a correlation of sodium intake using the data from dietary intake is recommended.