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Correlation study between estimated 24-hr urinary sodium using tanaka and kawasaki formula and measured 24-hr urinary sodium

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Abstract

Sodium intake is rarely monitored in clinical practice although it has been associated with development of high blood pressure. 24-hour urine collection for sodium excretion (24-HrNa) is the most reliable method in estimating sodium intake, but the method is rather cumbersome. Thus, this study was done to study the correlation between estimated 24-hr urinary sodium using Tanaka and Kawasaki formulae which utilise spot urine sodium (SUNa) with measured 24-HrNa. Methods: The study was carried out in three different locations with a total of 430 subjects aged between 19 to 40 years old. Second morning urine (SMU) were collected from all 430 subjects whereas 24hr urinary samples were collected from 77 subjects. Samples were analyzed for sodium using indirect ion-selective electrode (ISE) method. Tanaka formula [estimated 24HUNaV $[(Y^{Na}) = 21.98 \times XNa0.392]$ and Kawasaki formulae [estimated 24HUNaV $16.3 \times ((mmol/L) \times predicted\ 24\ hour\ urinary\ Cr\ (mg/day))]$ were used to calculate the estimated 24hrNa. Results were analysed using the SPSS 22.0 for statistical analysis. Results Mean Na were 155 mmol/day, 158 mmol/L, 147 mmol/day, 221 mmol/day for 24-HrNa (n=77), SUNa (n=430), estimated 24-HrNa Tanaka (n=430) and 24HrNa Kawasaki (n=430) respectively. There were weak correlations between measured 24-HrNa with 24-HrNa Tanaka and 24-(P < 0.000) respectively. B-A plot showed mean bias of 6.82 mmol/ day (95% CI:-129.98, 142.63 mmol/ day) (Tanaka) and -64.70 mmol/ day (95% CI:-216.81, 87.4 mmol/ day) (Kawasaki). There was proportional error with tendency to under and over-estimate of 24-HrNa observed with 24-HrNa Tanaka and there was overestimation of 24-HrNa observed with 24-HrNa Kawasaki. The upper and lower bound of limit of agreement was wide with percentage of error of 87.6% and 98.1% for 24-HrNa Tanaka and 24-HrNa Kawasaki, respectively. Conclusion Estimation 24-HrNa Tanaka and 24-HrNa Kawasaki were not reliable to estimate 24-hour urinary sodium excretion. Significant correlation between the estimated 24HrNa and measured 24-HrNa indicate potential usefulness of SUNa in estimation of sodium intake. Further study using multiple SU samples may improve this study. © 2020, Advanced Scientific Research. All rights reserved.

Author Keywords

Tanaka and Kawasaki Formula; Urinary Sodium

Index Keywords

adult, Article, body mass, correlation analysis, correlational study, creatinine urine level, diastolic blood pressure, female, human, human experiment, Kawasaki formula, male, middle aged, multicenter study, normal human, questionnaire, salt intake, sodium excretion, sodium intake, sodium urine level, systolic blood pressure, Tanaka formula, urinalysis, urine sampling, urine volume

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