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Development of an Accurate Method for Salt Intake Assessment in Children from a Single Urine Sample

Sayaka Kato, Asako Nakagawa, Yuki Ito, Michihiro Kamijima

Department of Occupational and Environmental Health,
Nagoya City University Graduate School of Medical Sciences

Summary

It has been reported that there is a positive correlation between salt intake and salt taste preference in childhood. Therefore, estimation of salt intake in children is important for appropriate future salt intake management. Daily salt intake is estimated from creatinine (Cr) concentration in spot urine samples, 24-hour urinary Cr excretion (24UCr), and sodium (Na) concentration. In adults, 24UCr is calculated using sex, height, and weight, or calculated as 1 g per day. However, since the calculation method of 24UCr, which is part of this formula, has not been established for children, clarification of this is necessary to estimate daily salt intake in children.

The study included 24 boys and girls aged 6-12 years living in Aichi Prefecture. Individuals with nocturia and those with muscle, renal, or neurological diseases that might affect creatinine excretion were excluded. One-day urine samples were collected, and creatinine and sodium concentrations, specific gravity, and height, weight, muscle mass, and fat mass were measured. Bland-Altman plots were used to compare the results with existing creatinine calculation methods. Furthermore, machine learning was performed on the test and validation data, which were divided 4:1. Multiple regression analysis was used to establish an equation for estimating 24UCr. The results were used to estimate daily salt intake and its evaluation.

The mean age was 8.6 years (SD, 1.5) and 109.5 months (SD, 17.3). There were no significant differences in height, weight, body mass index (BMI), or body surface area between the sexes. However, the mean muscle mass of boys was significantly higher than that of girls. Furthermore, there were no differences in the concentration of creatinine (Cr), sodium (Na), specific gravity, or urine volume between the sexes. The estimated salt intake from daily urine was 4.6 g. Bland-Altman plots demonstrated fixed errors, trends, or both for nine of the ten methods. Regression analysis was employed to develop estimating equations based on the best model from machine learning. Additionally, trends were observed in the method for predicting daily salt intake using these results. The estimated daily salt intake obtained from the results of this study was found to be lower than that reported in previous studies and in the National Nutrition Survey of 2019.

The method of estimating the daily salt intake from the 24UCr estimation equation has been found to have some errors, and further improvement is necessary. Further study of the relationship between Na and 24Cr excretion is necessary to complete the salt intake estimation equation with even higher accuracy in the future.