Dietary factors associated with urinary sodium to potassium ratio in Japanese preschool children

Kenichiro Yasutake1, Mikako Nagafuchi2, Toshiaki Tanaka3, Tomomi Kajiyama4, Takuya Tsuchihashi5, Kenji Ohe6, Munechika Enjoji7
1Department of Nutritional Sciences, Faculty of Nutritional Sciences, Nakamura Gakuen University 2Division of Early Childhood Care and Education, Nakamura Gakuen Junior College 3Department of Childhood Care Nutritional and Education 4Health Care Center, Fukuoka University 5Hypertension Center, Steel Memorial Yawata Hospital

Abstract

Objective: The normal range of urinary sodium level (Na) in Japanese preschool children is higher and that of potassium (K) lower than recommended by the WHO, resulting in high urinary sodium/potassium ratio (U-Na/K). The aim of this study was to investigate the dietary factors that influence this high U-Na/K in Japanese preschool children and to create a basis for salt-reduction education.

Design: Observational study

Setting: We collected samples of the subjects’ first morning urine for two consecutive days along with a dietary questionnaire called BDHQ3y (Brief-type Self-administered Diet History Questionnaire for Japanese children aged 3-6 years). The results of the dietary questionnaire were corrected by the density method (g/1000 kcal). U-Na/K was calculated using the child’s target Na (mEq/L) or Cr and K (mEq/L) or Cr.

Participants: The study population included 4 to 5 year-old preschool children attending collaborating kindergartens four located in Fukushima prefecture (southern region of Japan) and two in Fukuoka prefecture (southern region of Japan).

Materials & methods:

The study included 42 children who agreed to participate and provided informed consent. The average age of the children was 4.5 years. U-Na/K and potassium, positive correlation was found between sodium (β=0.2009) and potassium (β=0.1675), significant predictors when assessed using multiple regression analysis. For food, multiple regression analysis showed: fruits (β=0.1725), pickles (β=0.1515), soft drinks (β=0.1512), seasoning spices (β=0.1124), and noodles (β=0.1064) as significant predictors. There was no correlation with sex or between northern (Fukushima prefecture) and southern (Fukuoka prefecture) regions of Japan. Conclusion: The U-Na/K correlated positively with consumption of pickles, soft drinks, seasoning spices and noodles and negatively with consumption of fruits in Japanese preschool children.

Background & Aim

Heig Na/K is known to be a high-risk factor for cardiovascular disease. Even in children, high Na intake leads to future high blood pressure. We have reported that almost all of the 104 Japanese preschool children studied had not cleared the recommended urinary-Na and urinary-K level as determined by measuring their first morning urine for 12 days. Babies with high salt intake at 9 months of age will have a significantly high salt intake at 18 months. The preference towards sodium in humans is known to develop as early as infancy. Dietary patterns at 3 years of age continue thereafter. Thus, it is important to check these early phases of life. In order to solve this problem, we need to find out the dietary food that influences Na/K in Japanese preschool children.

Dietary intake

BDHQ3y consists of 89 questions on both sides of an A3-size sheet. It can calculate an individual’s monthly habitual intake of nutrition and food. The intake value calculated by the BDHQ3y was used for analyses by correcting the value to per 1000 kcal by the density method.

Intervention schedule

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Characteristics of participants

Distribution of U-Na/K

Analysis: Spearman’s rank correlation coefficient

The correlation coefficient was 0.216 and although low, it is comparable with previous studies that showed a correlation between urinary excretion and dietary estimates of habitual sodium-intake.

Correlation between U-Na/K and nutrients intake calculated using dietary survey

Analysis: Spearman’s rank correlation coefficient

These pickles, seasoning spices, and noodles have high sodium content and are known to be high sources of salt intake for adults. Thus, it is important to check these early phases of life.

Fruits are known to have high potassium content and the estimated potassium values were close to what we had expected. Furthermore, eating habits of infants are strongly influenced by their parents.

We need to teach parents and caregivers to prepare a proper diet for the children and lower the risk of future non-communicable diseases.