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COMMENT

The spot urine sodium-to-potassium ratio as a marker of hypertension risk

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Excessive sodium intake has long been recognized as a risk factor for hypertension. The first step to preventing hypertension is to accurately calculate one's sodium intake. Because approximately 93% of dietary sodium is excreted in the urine [1], 24-h urine collections can be used to determine real-time sodium intake. However, due to the substantial day-to-day variation in dietary sodium intake, it is difficult to obtain an accurate estimate of the usual sodium intake from a single 24-h urine collection. Therefore, repetitive sampling may be necessary to accurately estimate sodium intake [2], but it is inefficient and time-consuming for primary prevention.

Recently, great emphasis has been given to the urinary sodium/potassium ratio (Na/K ratio) as another indicator of the burden of sodium on blood pressure (BP). Because potassium lowers BP, the Na/K ratio is more closely correlated with concurrently measured BP than sodium alone or dietary sodium intake [3], as estimated by the Tanaka formula [4]. Furthermore, since the Na/K ratio does not require a creatinine value, it can be easily determined with simple equipment [5] that enables the recording of several measurements over the course of a day. According to a previous study [6], measurements of six random daytime casual urine samples on separate days are necessary to determine the usual Na/K level. However, it is unclear how many measurements are required to achieve Na/K values that can be relied upon for assessing hypertension risk. According to a study published in this issue of *Hypertension Research*, Kogure et al. [7] reported the result of an association analysis between multiple daily measured morning urinary Na/K ratios and home BP levels that helped to resolve this unanswered question. From an analysis of the 1-day to 10-day mean values of the urinary Na/K ratios and home-measured BP levels, they suggested that a measuring period of more than three days would be beneficial. These valuable findings contribute to the practical application of the spot urine Na/K ratio as a marker of hypertension risk.

Another issue that makes the practical application of the Na/K ratio difficult is the lack of an exact cutoff value. Due to the linear correlation between the urinary Na/K ratio and home BP level, Kogure et al. [6] were unable to determine a cutoff value using the same dataset. However, as shown in Table 2 of Kogure's publication, a urinary Na/K ratio ≥6.0 was consistently associated with the home BP level with an odds ratio greater than 2.0, regardless of the number of measurement days, and approximately 20% of the subjects in their study had a 10-day mean urinary Na/K ratio level ≥6.0 (Fig. 1). Therefore, the spot urine Na/K ratio may be beneficial in identifying groups at high risk of developing hypertension. According to a general population-based longitudinal study by Nagahama [3], approximately 8% of the subjects had Na/K ratios ≥6.0 in their spot urine collected between 0900 and 1700 h at the baseline. Many variables, including fasting time, renal function, and testing season, affect the spot urine Na/K value [3], and therefore, the measurement timing is important when employing the spot urine Na/K ratio as a risk indicator of hypertension. Biologically and practically, the best way to standardize measurement settings is to use morning spot urine, which was used in the study by Kogure et al. However, it should be noted that elderly patients may underestimate their morning urine Na/K ratio levels because of their frequent nocturnal urination [8] and elderly people are more salt-sensitive, which increases their nocturnal sodium excretion during the night [9, 10].

Urinary Na excretion can be reduced by restricting sodium intake. Furthermore, the urinary Na/K ratio can also be lowered by increasing the consumption of potassium-rich foods such as leafy greens, fruits, and dairy products

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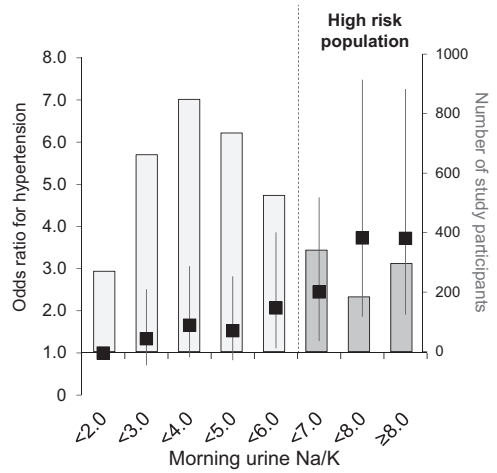

Fig. 1 Associations between a 3-day mean morning urinary sodium-to-potassium ratio and home blood pressure levels based on a study by Kogure et al. [7]. The box plot depicts the odds ratio and 95% confidence interval, while the bar graph depicts the number of study participants

[11]. The correlation between the Na/K ratio and BP level remains consistent regardless of the Na and K concentrations [12]. However, increasing potassium intake may be more helpful in lowering BP levels in middle-aged people with preserved renal function, while sodium restriction may be more effective in older people [12].

Compliance with ethical standards

Conflict of interest The author declares no competing interests.

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