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COMMENT

Utility of urinary sodium-to-potassium ratio for identifying individuals at elevated risk of heart failure

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Comment on original articles, Muroya and Satoh et al.'s "Association between Urinary Sodium-to-Potassium Ratio and BNP in a General Population without Antihypertensive Treatment and Cardiovascular Diseases: The Ohasama Study"

Heart failure (HF) is an increasingly prevalent cause of hospitalization and mortality worldwide. Many cases are attributable to lifestyle-related factors, including hypertension, diabetes, and obesity [1–4]. Early detection of the preclinical stage is critical for preventing progression to symptomatic HF [5, 6]. If non-invasively, low-cost tests could reliably detect individuals who are in the preclinical phase of HF or at elevated risk of developing symptomatic HF among community-dwelling populations, these tests could help prevent the development of symptomatic HF.

Muroya, Satoh and colleagues conducted a cross-sectional study aimed to examine the association between the urinary sodium-to-potassium ratio and the cardiac biomarker B-type natriuretic peptide (BNP) among community-dwelling Japanese adults (mean age 65 years) [7]. The clinical practice guideline on the diagnosis and management of HF has defined asymptomatic Stage B HF, which is characterized by evidence of structural heart disease such as left ventricular dysfunction or hypertrophy without overt clinical signs or symptoms of HF [5]. The Heart Failure Society of America, the Heart Failure Association of the European Society of Cardiology, and the Japanese Heart Failure Society have proposed a universal definition and classification of HF [8]. In this proposal, an individual with an elevation in cardiac biomarkers, including BNP ≥ 35 pg/mL, is classified as having early asymptomatic Stage B HF [8]. In Muroya, et al.'s study, although the correlation between the urinary sodium-to-potassium ratio and BNP was modest ($r = 0.17$), participants in the highest tertile of the urinary sodium-to-potassium ratio had an approximately two-fold higher prevalence of BNP ≥ 35 pg/mL compared with those in the lowest tertile. These findings suggest that a higher urinary sodium-to-potassium ratio is associated with a greater prevalence of asymptomatic Stage B HF, i.e., the preclinical phase of HF.

In hypertension management, assessing an individual's risk of cardiovascular disease, including the development of symptomatic HF, is important [3, 9–11]. High BP and hypertension are well-established risk factors for HF incidence, and several systematic reviews and meta-analyses have reported that elevated BP and hypertension are associated with an increased risk for development of symptomatic HF [3, 11–15]. Further, several observational studies have reported associations of office and out-of-office BP levels with BNP [16, 17]. A urine sodium test is preferable to evaluate individual salt intake, and it is recommended, along with out-of-office BP monitoring, in the management of hypertension [10]. In 2023, the American Heart Association released a new equation for predicting cardiovascular risk, the Predicting Risk of cardiovascular disease EVENTs (PREVENT) model, which can calculate an individual's future risk of developing symptomatic HF [9, 18]. Adding non-invasive, cost effective assessments, e.g., urine tests, out-of-office BP monitoring, to established prediction models may improve accuracy of predicting development of symptomatic HF or identifying individuals who are in the preclinical stage of HF (Fig. 1).

In conclusion, the study by Muroya and Satoh, et al. provides novel evidence of a relationship between the urinary sodium-to-potassium ratio obtained from a spot urine sample and the validated cardiac biomarker BNP.

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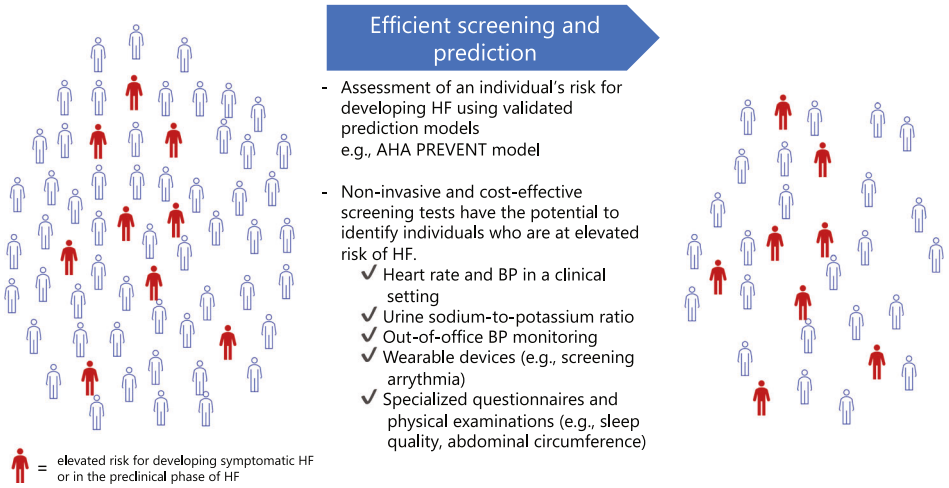

Fig. 1 Efficient screening pathway using non-invasive, cost-effective assessments. Non-invasive, low-cost tests may help identify individuals at elevated risk of cardiovascular disease, including heart failure. In the initial step for routine health checks or in primary care, urine sodium-to-potassium ratio, out-of-office blood pressure monitoring, and others can be applied to flag people who are potentially at high cardiovascular risk. In the subsequent step, individuals flagged as elevated risk undergo confirmatory testing in a clinical setting. Urinary sodium-to-potassium ratio may serve as an efficient primary screening tool for detecting individuals at elevated risk of cardiovascular disease including failure

Disparities in access to care persist, and challenges remain in the early detection and prevention of HF [1, 4]. However, the urinary sodium-to-potassium ratio may have practical advantages: it is inexpensive and non-invasive, and may be useful for identifying individuals in the preclinical phase of HF among community-dwelling populations. Incorporating this metric into routine health examinations could therefore facilitate the large-scale identification of individuals with preclinical HF and enable timely preventive strategies.

Compliance with ethical standards

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