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COMMENT

Detailed cross-sectional association between traditional risk factors and high systolic blood pressure in a Japanese population

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High blood pressure (BP) is a well-known and robust risk factor for cardiovascular disease. The population approach has a significant impact on preventing hypertension, and data from surveys with a wide range and large sample size are required to develop a plan of action.

Takase et al. conducted a cross-sectional study in the Tohoku Medical Megabank Community-based Cohort Study to investigate the association between traditional hypertension risk factors and systolic BP in Japan [1]. They showed that higher levels of age, body mass index (BMI), estimated daily salt or potassium intake, urinary Na/K ratio, and gamma-glutamyl transferase (GGT) were significantly associated with systolic BP. The present study demonstrated the precise association between each factor and hypertension by treating each variable as finely categorized.

The association between age and BP are clearer in women than in men [1]. The Ohasama study, which investigated out-of-office BP measurements among rural residents, showed similar results using self-measured BP at home (home BP) [2]. At least at the population level, BP in women seems to increase almost linearly over 40–70 years without an obvious and specific steep change around 50 years of age, when menopause may occur. The results for the other traditional factors are summarized in Fig. 1. The results obtained after including all the factors in the same statistical model may indicate a direct (independent) association between each factor and systolic BP, although unmeasured confounders should be considered. As described in previous studies, BMI appears to be a strong risk factor for high BP. While a high BMI is expected to be associated with high salt intake, the model including BMI revealed significant associations between estimated salt intake or urinary Na/K ratio and high systolic BP. Their previous study demonstrated a positive association between the urinary Na/K ratio and hypertension based on home BP [3]. Interestingly, the Ohasama study showed that the urinary Na/K ratio was not significantly associated with nighttime BP during sleep but with awake BP, especially awake BP obtained by home BP measurement [4]. Drinkers consuming over 23 g of alcohol per day were associated with high systolic BP [1]. However, despite consuming less than 23 g of alcohol per day, habitual alcohol consumption may increase BP immediately after waking up [5], whereas the study by Takase et al. used office BP as the outcome measure. After adjusting for various factors including alcohol consumption, GGT was found to be associated with high systolic BP [1]. Since GGT is considered to be only a marker of hepatic or biliary dysfunction or alcohol intake, there might have been confounding factors such as fatty liver disease, a high-fat diet, or reporting bias in the self-reported questionnaire on alcohol consumption. A recent study indicates an association between East Asian-specific mutations in aldehyde dehydrogenase 2 and disease onset [6]. The possibility that GGT elevation may be modified by the presence of potential genetic variants should be considered. However, a comprehensive analysis is required, as other Mendelian randomization results cited by the authors indicate that the rs671 genotype has no effect on GGT elevation [7].

Because the study by Takase et al. is a cross-sectional study, their results are susceptible to reverse causality [1]. For example, the inverse association between smoking

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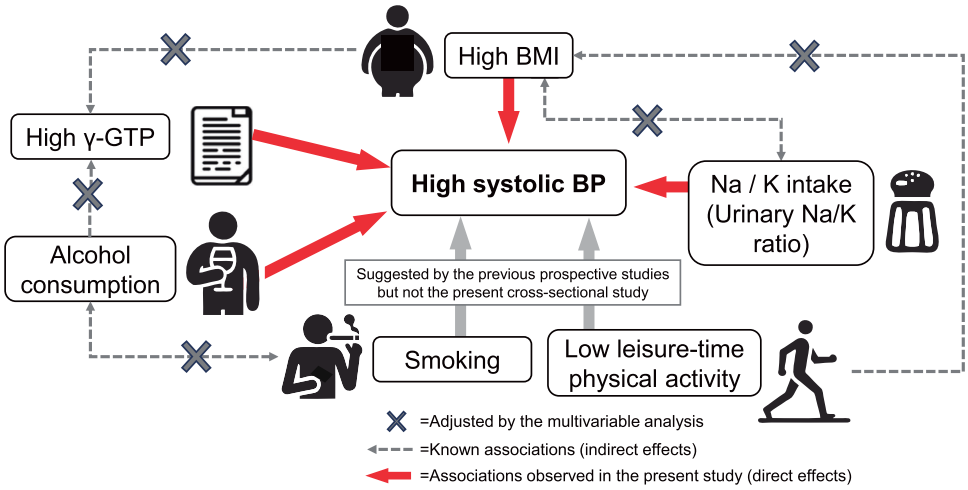

Fig. 1 A summary of the results regarding the traditional risk factors. Age and sex are not included because they commonly contribute to all other hypertension risk factors

status and high systolic BP should be interpreted with caution. Although the authors mentioned that the results on the association between smoking and hypertension were inconsistent, most prospective studies demonstrated the adverse effects of smoking on hypertension [8–11]. Recent results from the Ohasama study also showed a clear association between current smoking status and the incidence of hypertension detected by home BP measurements [12]. Similarly, the lack of significant association between low leisure-time physical activity and systolic BP should be interpreted with caution [1]. Low physical activity and smoking are known risk factors not only for hypertension but also for other diseases, and therefore must be public health targets.

Discrepancies in the factors associated with systolic and diastolic BP should be explored in the future. Especially in younger Asian populations, diastolic BP may be strongly associated with the risk of chronic kidney disease [13]. Furthermore, 32.8% of the study population received antihypertensive treatments. Although they reported the results after excluding patients treated for hypertension in a sensitivity analysis, the information on participants receiving antihypertensive treatment is also helpful for clinical practice.

Factors associated with the disease may change over time. Continued studies on risk factors are needed to understand the situation at any given time and to consider an effective approach for a population.

Compliance with ethical standards

Conflict of interest M.S. received Academic Contributions from Bayer Yakuhin. Because of their close relationship with Takase et al., the authors of this commentary were not involved in any aspect of the peer review process for their submission.

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