CORRESPONDENCE

Response to Fujisawa: Elevated blood pressure in different populations: the role of dietary salt consumption

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In a fascinating account of a natural experiment on the possible impacts of lifestyle on blood pressure (BP), Fujisawa *et al.*¹ report the relationship of BP with age and body mass index (BMI) among people living in two regions of Papua, Indonesia. One study site was the Soroba village in the central highlands, where the indigenous inhabitants were reported by the authors to maintain a traditional way of life. The study sample from this village included 46 men and 54 women with mean systolic and diastolic BP of 118 and 73 mm Hg, respectively. The other study site was the small mercantile town of Bade in the southern coastal lowlands, where it was reported by the authors, the residents practice a more modern lifestyle with increasing dietary intake of salt and sugar. The study sample from this town included 38 men and 50 women with mean systolic and diastolic BP of 144 and 80 mm Hg, respectively. The prevalence of hypertension (systolic BP ≥ 140 mm Hg or diastolic BP ≥ 80 mm Hg, or using antihypertensive medication) was 8% in the Soroba sample and 56% in the Bade sample.

Probably contributing to these marked differences in BP, the subjects from Bade were about 10 years older on average and were more often overweight or obese (26 persons in the Bade sample but only 3 persons in the Soroba sample had BMI $> 25 \text{ kg m}^{-2}$, and median BMI was around 2 kg m^{-2} greater for the Bade sample despite the slightly lesser proportion of males). In unadjusted analyses, Fujisawa *et al.*¹ found no association of BP with age or BMI among the subjects from Soroba, but a positive association of BP with age and BMI in the sample from Bade, and thus attribute their findings to the impact of social globalization on human physiology.

Although details of the sampling design were not provided, it seems clear that the population of Soroba contains individuals who, in adult life, have remained lean with low BP. As Fujisawa *et al.*¹ noted, the pathophysiological phenomenon of little or no BP rise with increasing age, and a low prevalence of hypertension, has been identified in other remote populations of the world. For those remote populations included in the INTERSALT study,² the favorable BP patterns among remote populations were attributed to their low-salt intake^{3,4} rather than other lifestyle factors or unusual population genetics.^{5,6}

In our population-based study,⁷ we studied samples of the Caucasian (Australian) and Asian (Vietnamese) populations selected by stratified multi-stage random sampling. The mean systolic BP in each sample was around 15 mm Hg higher than that in the similarly aged sample from Soroba, and the percentages with hypertension were 32.4% in the Caucasian sample and 25.7% in the Asian sample. The higher BP of the Vietnamese participants than that of those from Soroba is apparent despite almost identical median BMI. Relative to the men and women in the Soroba sample, the Vietnamese women had higher mean systolic BP (126 mm Hg) and a higher percentage of women with hypertension (21.3%), despite almost no exposure to personal tobacco smoking or alcohol and similar body size. Higher salt intake is a possible culprit.

In formal analyses we found a similar positive association of BP with age in the Caucasian and Asian samples, irrespective of sex. In both populations, there was a fall (or leveling off) of diastolic BP together with a rise in systolic BP and pulse pressure (PP) with increasing age particularly after the fifth

decade. This is consistent with age-related abnormalities of the arterial wall, resulting in large-artery stiffness.^{8,9} To examine the relationship between BP and BMI, we adjusted for age and restricted the analysis to the range of overlapping BMI in the two populations. We found that PP was positively associated with BMI among the Caucasians but not among the Asians. This may be indicative of increased large-artery stiffness among the Caucasians, similar to the positive association of PP with age after about 50 years of age. Conversely, an increase in mean arterial pressure (arising from increase in both systolic and diastolic BP) with increasing BMI was observed among the Asians, which suggests a more typical type of essential hypertension rather than arterial stiffness-induced hypertension. This may be a result of increased circulatory volume or peripheral vascular resistance, possibly due to higher salt intake among the Asians.¹⁰ These differences suggest a different pathophysiology related to hypertension in Caucasians and Asians.

In summary, these data appear to be consistent with the hypothesis that high salt intake is a key factor in the development of elevated BP. Lowering the dietary salt intake is strongly recommended to reduce the cardiovascular risk, associated with hypertension.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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