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The interaction between sodium to potassium intake and genetics to inform dietary management in hypertension

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Blood pressure (BP) is influenced by both genetics and diet. Dietary management of hypertension includes increasing potassium-rich foods while reducing sodium intakes. Dietary sodium and potassium intakes can be measured objectively using urinary sodium and urinary potassium, with lower urinary sodium to potassium ratios associated with lower BP[(1)]. Understanding the interplay between diet and genetics may be useful in treating hypertension and determining which individuals may receive an outsized benefit from lowering their sodium potassium ratio. This study aims to investigate whether identifying genetic risk for hypertension could be utilised to identify individuals who may benefit most from lowering sodium intake and increasing potassium intake. UK Biobank cohort participants (n = 296,475) with data on genotype, BP and spot urinary sodium and potassium data were used. Diet quality was assessed using Oxford WebQ. Biologically directed genetic scores for BP were constructed for pathways related to sodium/potassium biology (pharmagenic enrichment scores [PES]), as well as traditional polygenic risk scores (PRS). A gene-by-environment effect between urinary electrolytes, diet quality and PRS on BP were tested. Genetic risk, diet quality and urinary electrolytes independently correlated with BP. Urinary sodium had larger BP increasing effects amongst individuals who had high genetic risk in sodium/potassium pathways than those with comparatively lower genetic risk. Higher diet quality had a small effect on reducing BP in baseline PRS models, but this did not remain significant in the full model. Polygenic scores for BP personalised to individual sodium/potassium biology (PES) could be used to identify individuals who may receive an outsized benefit from a personalised sodium/potassium dietary intervention. These findings may inform future precision and personalised dietary advice for the management of hypertension.

Keywords: precision nutrition; blood pressure; sodium; potassium

Ethics Declaration

Yes

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Reference

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