

Insights into the association of potassium intake with blood pressure: results of a dose-response meta-analysis of randomized controlled trials

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Introduction

Observational studies provide evidence for an association between potassium intake and levels of blood pressure (BP). However, uncertainties still exist about the shape and the magnitude of the dose-response relation. Conversely, experimental studies have not been used to estimate dose-response curves, since standard methods can only be applied in trials including at least three exposure groups.

Materials and Methods

We carried out a systematic review of the evidence concerning the effect of potassium supplementation on BP in epidemiologic experimental studies. Following a PubMed search up to August 31, 2019, we included randomized controlled trials (RCTs) which evaluated potassium supplementation as the only intervention applied for at least four weeks. We performed a dose-response meta-analysis using a restricted cubic spline model and the 'one-stage' approach, a newly-developed statistical procedure which allows inclusion of studies with as few as two categories of exposure (Stat Methods Med Res. 2019;28:1579-1596). Finally, we repeated the analyses stratifying for hypertensive status and use of anti-hypertensive medication.

Results

We included 32 RCTs in adult populations, with potassium supplementation ranging from 30 mmol (1.2 g) to 140 mmol (5.6 g) per day. The RCTs' duration ranged from 4 up to 15 weeks. Most of the studies have a cross-over design (N=23), include hypertensive individuals (N=26) and subjects not under anti-hypertensive medication (N=26).

Overall, a daily increase of 40 mmol (1.6 g), 80 mmol (3.2 g) and 120 mmol (4.8 g) of potassium resulted in reductions of systolic BP by -3.86 (95% CI -5.74, -1.97), -2.89 (95% CI -4.39, -1.40), and -1.09 mmHg (95% CI -4.29, +2.12), respectively (Figure). Higher potassium intakes also resulted in reduced diastolic BP levels by -2.49 (95% CI -4.09, -0.89) and -0.99 mmHg (95% CI -3.80, +1.81) for 40 and 80 mmol/day of potassium increase, while further increase to 120 mmol/day resulted in increased diastolic BP by +1.20 mmHg (95% CI -5.75, +8.15). The effect of potassium intake on BP was larger among hypertensives than normotensives and among pharmacologically untreated hypertensives compared to their treated counterparts. Subgroup analyses according to study design (parallel vs. crossover) yielded similar results.

Discussion

With the application of advanced dose-response modeling on RCT results, a U-shaped relation between potassium intake and blood pressure levels was observed. A low to moderate increase in potassium intake resulted in a progressive reduction in both systolic and diastolic blood pressure and the effect was stronger among untreated hypertensives.

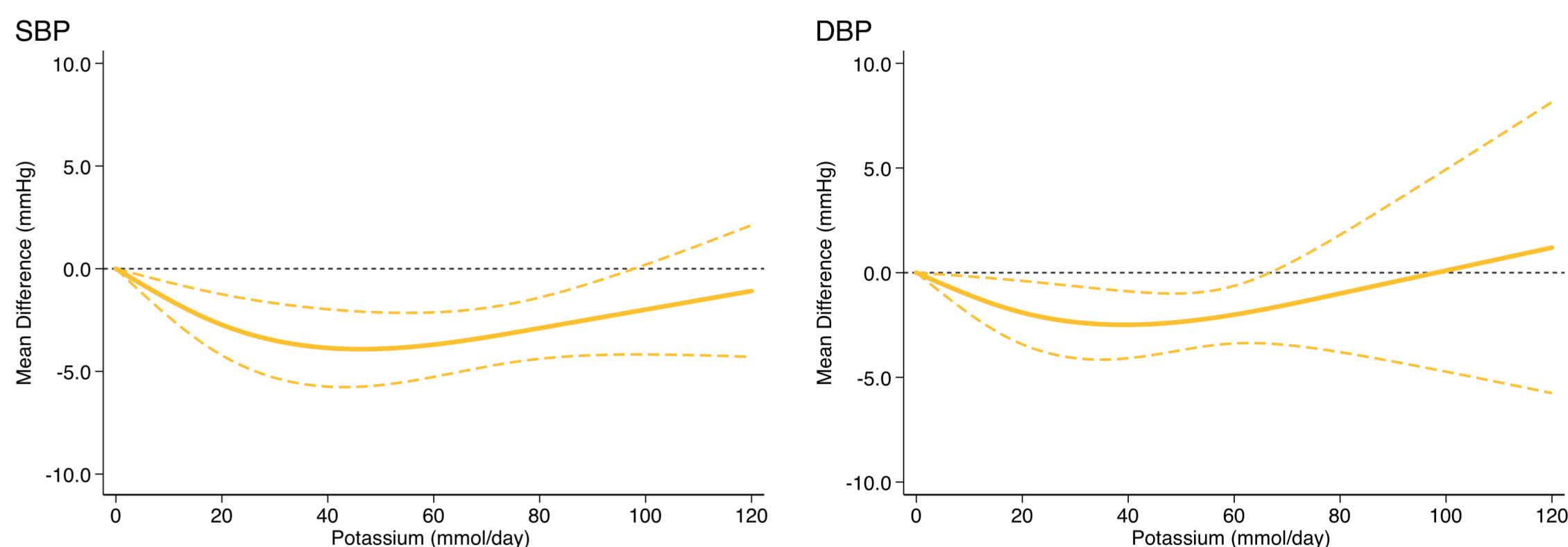


Figure. Dose-response meta-analysis of mean difference of systolic (SBP) and diastolic (DBP) blood pressure levels in all trials according to differences in potassium excretion between arms at the end of the studies. Spline regression analysis curve (solid line) with 95% confidence limits (dashed lines).