Potassium intake, stroke, and cardiovascular disease: a meta-analysis of prospective studies
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CRD summary
This review found that higher dietary potassium intake was associated with lower rates of stroke and might reduce the risks of coronary heart disease and cardiovascular disease. The conduct of the review was generally good, but methodological differences between studies and inaccurate estimates of potassium intake make the validity of the conclusions uncertain.

Authors' objectives
To assess the relationship between regular potassium intake and the incidence of stroke and cardiovascular disease.

Searching
MEDLINE, EMBASE, AMED, CINAHL, PsycINFO and The Cochrane Library were searched to December 2009, without language restrictions; search terms were reported. Reference lists of recent studies and reviews were searched.

Study selection
Prospective studies assessing potassium intake in adults were eligible for inclusion if they reported fatal or nonfatal strokes, cardiovascular disease, or coronary heart disease as outcomes. Studies had to report the number of participants exposed and the number of events for categories of varying potassium intake. They also had to report the relative risk or hazard ratio for each potassium-intake category and have an average follow-up of at least four years.

The included studies were conducted in the USA, Finland, Japan, the Netherlands, Scotland, or Taiwan. Most of them recruited both male and female participants, but two recruited only men and one recruited only women. Potassium intake was assessed by food frequency questionnaires, 24-hour urine excretion and 24-hour dietary recall. The average potassium intake ranged from 45 to 85 millimoles (mmol) per day in all but one study where the average intake was 125 mmol per day. All the studies used multivariate regression analysis to control for confounding factors such as age, gender, body mass index and smoking.

Two reviewers independently selected studies and disagreements were resolved by discussion with other reviewers.

Assessment of study quality
Study quality was assessed using an adapted version of the Downs and Black checklist containing 19 questions on reporting, external validity, bias and confounding. A higher score indicated better quality out of a maximum of 19.

The numbers of reviewers involved in quality assessment was not reported.

Data extraction
The cardiovascular outcome rates, potassium intake assessment method, levels of potassium intake for each category, and risk or hazard ratio comparing different potassium intake categories, were extracted by two reviewers independently. Disagreements were resolved by discussion with other reviewers and authors were contacted for missing data, if necessary.

Methods of synthesis
Statistical heterogeneity was assessed using $X^2$ and $I^2$. If significant heterogeneity was found, the results were pooled using an inverse-variance random-effects model, otherwise a fixed-effect model was used. Funnel plots and Egger's regression test were used to assess publication bias.

Sensitivity analysis was used to assess the influence of individual or groups of studies on the pooled results. Subgroup analysis and meta-regression was used to assess gender, country, duration of follow-up, method of potassium intake assessment, differences in potassium level, study quality, baseline blood pressure and body mass index, as sources of heterogeneity.
Results of the review
Eleven studies with 247,510 participants were included in the meta-analysis. Quality scores ranged from 14 to 18. The mean weighted follow-up was 12.2 years (range five to 19).

**Stroke:** In 11 studies, a higher potassium intake (average weighted difference 42.1mmol per day) was significantly associated with a lower risk of stroke (RR 0.79, 95% CI 0.68 to 0.90). There was heterogeneity between the studies ($I^2=55\%$), but no evidence of publication bias. No influential studies were found in the sensitivity analysis.

**Coronary heart disease:** In six studies, there was no evidence of a relationship between higher potassium intake and the risk of coronary heart disease. The studies showed some heterogeneity ($I^2=45\%$). There was no evidence of publication bias. Sensitivity analysis showed that the removal of one study resulted in a statistically significant reduction in risk with a high intake.

**Cardiovascular disease:** In four studies, there was no evidence of a relationship between higher potassium intake and the risk of cardiovascular disease. Heterogeneity was high ($I^2=71\%$). There was no evidence of publication bias. Sensitivity analysis showed that the removal of one study resulted in a statistically significant reduction in risk, with a high intake, and removed the heterogeneity.

**Subgroup analyses:** Analysis of the 10 studies reporting relative risks adjusted for baseline blood pressure or hypertension status confirmed the inverse relationship between potassium intake and stroke risk and similar results were seen in an analysis of the nine studies that adjusted for baseline body mass index or body weight.

**Meta-regression:** This analysis found that the length of follow-up and the quality score were significant sources of heterogeneity for cardiovascular disease and including them in the analysis reduced the estimated between-study variance.

**Authors’ conclusions**
Higher dietary potassium intake was associated with lower rates of stroke and might reduce the risks of coronary heart disease and cardiovascular disease.

**CRD commentary**
This review specified clear inclusion criteria. A number of relevant databases were searched, without language restrictions, which reduced the risk of language bias. The authors found no evidence of publication bias. Study quality was assessed, but only the total score was reported. Most studies had high scores, but the specific quality of the evidence was unclear. To reduce error and bias the study selection and data extraction were performed by two people. The analysis methods were appropriate and statistical heterogeneity was explored.

The conduct of this review was generally good, but methodological differences between studies and inaccurate estimates of potassium intake make the validity of the conclusions uncertain.

**Implications of the review for practice and research**
**Practice:** The authors stated that increased potassium intake by dietary changes, including increased fruit and vegetable intake, should be encouraged alongside other nutritional or lifestyle improvements.

**Research:** The authors did not state any recommendations for research.

**Funding**
Supported by a grant from the European Commission.

**Bibliographic details**

**PubMedID**
21371638
DOI
10.1016/j.jacc.2010.09.070

Original Paper URL
http://content.onlinejacc.org/article.aspx?articleid=1144243

Indexing Status
Subject indexing assigned by NLM

MeSH
Blood Pressure /physiology; Cardiovascular Diseases /prevention & control; Female; Humans; Male; Potassium, Dietary /administration & dosage /urine; Prospective Studies; Sodium, Dietary /administration & dosage; Stroke /prevention & control

AccessionNumber
12012016041

Date bibliographic record published
18/10/2012

Date abstract record published
28/11/2012

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.