Dietary fiber and blood pressure: a meta-analysis of randomized placebo-controlled trials

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CRD summary
This review estimated the effect of fibre supplementation on blood-pressure. The authors concluded that dietary fibre has a small effect on reducing blood-pressure. The conclusions appear to follow from the evidence presented. However, as the search was limited, it is probable that some relevant studies were missed.

Authors' objectives
To estimate the effect of fibre supplementation on blood-pressure (BP), both overall and for specific subgroups.

Searching
MEDLINE was searched from 1966 to 2003 for studies reported in English; the search terms were reported. The reference lists of original research and relevant review articles were manually checked.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were the only studies eligible for inclusion in the review.

Specific interventions included in the review
Studies of fibre supplementation compared with placebo were eligible for inclusion. Studies were only included if the effect of fibre supplementation could be separated from any cointerventions that the participants received. The included studies evaluated both soluble and insoluble types of fibre from supplements or dietary interventions, at doses ranging from 3.5 to 42.6 g/day.

Participants included in the review
Any studies with human participants were eligible for inclusion. The mean age of the patients in the included studies ranged from 23 to 63 years. The populations in eight included trials were considered hypertensive.

Outcomes assessed in the review
Studies assessing BP as either a primary or secondary outcome were eligible for inclusion. Sitting BP was assessed where available; when unavailable, supine or awake ambulatory measurements were assessed.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The quality of the included studies was assessed by scoring the type of blinding in each study towards the treatments (i.e. open, single-blind and double-blind). The authors did not state how the papers were assessed for quality, or how many reviewers performed the quality assessment.

Data extraction
Study details were extracted using a data abstraction form; the authors did not state how many reviewers performed the data extraction. The systolic and diastolic BP measurements for each included trial were extracted. The dose of fibre was averaged when the intervention group received two different doses. Where necessary, the changes in BP were estimated from graphs and the levels of fibre received were calculated from a compliance table. Missing values for age and gender were imputed using the median value of the other trials. The net changes (with standard errors) in BP between the intervention and control group were extracted for each trial. The authors computed these where the data
Methods of synthesis
How were the studies combined?
The data were combined using a random-effects model according to Van Houwelingen et al. (reference given), which accounted for within-study and between-study variation. The presence of publication bias was assessed using a funnel plot, and a non-parametric trim-and-fill method was used to adjust for any potential publication bias.

How were differences between studies investigated?
Statistical heterogeneity was investigated by obtaining a Q statistic from a chi-squared test. Several subgroup analyses were defined a priori, based on age (40 years or younger versus older than 40), hypertensive status (yes versus no), gender (less than 50% male versus at least 50% male), body mass index (28 kg/m² or less versus more than 28 kg/m²) and type of fibre (soluble versus insoluble versus mixed).

Results of the review
A total of 24 RCTs met the inclusion criteria, of which one trial had two treatment groups that were compared with an identical placebo control group. Therefore, there were 25 treatment strata overall, with a total of 1,404 participants.

The meta-analysis showed a non-statistically significant effect of fibre supplementation on systolic BP of -1.13 mmHg (95% confidence interval, CI: -2.49, 0.23) and a statistically significant effect on diastolic BP of -1.26 mmHg (95% CI: -2.04, -0.48). Univariate subgroup analyses showed that systolic BP reduction was statistically significantly greater in those over 40 years of age, compared with those 40 years or younger (P=0.001), with overall effects of -3.08 mmHg (95% CI: -4.61, -1.56) and 0.35 mmHg (95% CI: -1.00, 1.69), respectively. It was also shown in univariate subgroup analyses that BP reduction was statistically significantly greater in hypertensive populations than normotensive populations. The overall effects on systolic BP for hypertensive and normotensive populations were -4.53 mmHg (95% CI: -6.69, -2.38) and -0.23 mmHg (95% CI: -1.43, 0.98), respectively (P<0.001), while the overall changes in diastolic BP for the same subgroups were -2.37 mmHg (95% CI: -3.56, -1.19) and -0.68 mmHg (95% CI: -1.44, 0.09), respectively (P=0.02). No other subgroup or sensitivity analyses showed any statistically significant effect of fibre supplementation on BP.

The funnel plot showed that there was a possibility that more small trials showing large reductions in BP were identified and included in the systematic review. Executing the trim-and-fill method revealed that one trial might have been missing from the review. When incorporating the results from this theoretical trial, the overall effect of dietary fibre on systolic BP was attenuated to -0.94 mmHg (95% CI: -2.34, 0.46)

Authors' conclusions
Dietary fibre has a small effect on reducing BP. Increasing fibre intake in the general population may contribute to the prevention of hypertension.

CRD commentary
The review question and inclusion criteria were clear and concise. The inclusion of only RCTs made it possible to ascertain whether a causal relationship existed between fibre supplementation and reduction in BP. Only one electronic database and reference lists were searched and unpublished literature was not sought, meaning that some relevant trials might have been missed. As only English language papers were eligible for inclusion, there was also a threat of language bias. Publication bias was investigated, and the authors acknowledged that the presence of this was a possibility. It was not reported whether any of the study selection or data extraction processes were carried out in duplicate, so it was not possible to ascertain the likelihood of reviewer bias or errors. The quality of the included studies was only assessed in relation to blinding.

The authors presented results from the individual studies and calculated appropriate measures of effects. Many subgroup analyses (defined a priori) were performed to investigate heterogeneity. The authors' conclusions follow from
the evidence identified. However, as the search was limited, it is probable that not all data pertinent to the review question were located.

Implications of the review for practice and research
Practice: The authors stated that increasing the intake of dietary fibre in Western populations may contribute to the prevention of hypertension.

Research: The authors did not state any implications for future research.

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