

The Effect of the Mediterranean Diet on Hypertension: A Systematic Review and Meta-Analysis

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ABSTRACT

Objective: The adoption of a Mediterranean diet (MD) pattern of eating is often described as a strategy to help prevent or manage hypertension. However, this dietary regimen has not been reviewed systematically for its efficacy against hypertension. Therefore, the purpose of this study was to analyze the effect of interventions of at least 1 year duration on blood pressure (BP) values through a systematic review and meta-analysis. The focus was on interventions comparing an MD with a low-fat diet.

Design: The authors accessed and searched PubMed and Scopus databases up to March, 2015. Randomized control trials comparing MD vs low-fat diet were included. The researchers assessed the methodological quality, extracted the valid data, and conducted the meta-analysis following Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines.

Results: Six trials (more than 7,000 individuals) were identified. Meta-analysis showed that interventions aiming at adopting an MD pattern for at least 1 year reduced both the systolic BP and diastolic BP levels in individuals with normal BP or mild hypertension. The effect was higher for the systolic BP (−1.44 mm Hg) but also consistent for the diastolic BP (−0.70 mm Hg). However, the results have to be interpreted with caution owing to the reduced number of studies eligible for inclusion in this meta-analysis. This situation limited the statistical power of the analyses. Furthermore, in all analyses, the pooled effect estimation showed a high evidence of heterogeneity, which compromises the validity of the pooled estimates.

Conclusions and Implications: A positive and significant association was found between the MD and BP in adults. However, in all cases the magnitude of the effect was small. Based on this limited group of studies and their heterogeneity, the authors found insufficient convincing evidence to suggest that the MD decreased BP. Further standardized research is urgently needed to reach evidence-based conclusions to clarify the role of MD in BP management, particularly in Europe and other societies where prevalence of cardiovascular diseases is increasing.

Key Words: Mediterranean diet, low-fat diet, hypertension, meta-analysis (*J Nutr Educ Behav.* 2015; ■:1-12.)

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INTRODUCTION

The Mediterranean diet (MD) was identified as a healthy diet in the middle of the 20th century, after the end of World War II, when the Greek government invited the Rockefeller Foundation to conduct an epidemiological study of the island of Crete in 1953.¹ Three decades later, Ancel Keys and colleagues² evaluated the relationship between the current diet and other coronary risk factors in 7 countries, some of which were in the Mediterranean Basin. The results obtained demonstrated the protective effect of a Mediterranean dietary pattern on cardiovascular disease (CVD) and mortality.

From the second half of the 20th century (1960), when the 7 countries study was conducted, to the second decade of the current century, the prevalence of CVD has increased in the Mediterranean countries, in Europe, and globally.³ Although the number of deaths attributed to CVD have decreased in most of the developed countries or followed a flat pattern in some Mediterranean countries over the decades,⁴ in 2014 the leading cause of death worldwide was some type of CVD, even in most of the Mediterranean countries.⁵ The main risk factor for developing CVD is high blood pressure (BP). The prevalence of raised BP in adults (defined as systolic and/or diastolic BP \geq 140/90 mm Hg) ranges from 19% (Israel) to 36% (Croatia) in the Mediterranean countries.³ The worldwide prevalence of high BP is 24% for males and 21% for females.³

Adoption of a healthy lifestyle, including consuming an adequate diet and engaging in moderate to vigorous activity, would reduce the prevalence of CVD by lowering its main risk factors, mainly hypertension, obesity, and dyslipidemia.⁶ The American College of Cardiology and the American Heart Association recently published updated recommendations for lowering BP based on a review of randomized controlled trials (RCTs), observational studies, meta-analyses, and systematic reviews of studies carried out in adults. The analysis concluded with the recommendation to follow a dietary pattern that emphasizes intake of vegetables, fruit, and whole grains; it includes low-fat dairy products, poultry, fish, legumes, and nontropical vegetable oils and nuts, and limits intake of sweets, sugar-sweetened beverages, and red meats.⁷ Such a pattern can be recognized in the Dietary Approaches to Stop Hypertension (DASH) diet and in the MD. According to the American College of Cardiology/American Heart Association report, there was strong evidence for recommending the DASH diet to reduce BP levels, but evidence for recommending the MD was low. Studies that evaluated the MD and its effect on BP levels that were included in the report were published up to 2009. The analysis included one observational study and 1 RCT.⁷

To evaluate the MD–BP relationship further, the purpose of this study was to conduct a systematic review and meta-analysis to analyze the effect of MD compared with low-fat diet (LFD) interventions, with at least 1 year duration, on BP values.

METHODS

Search Strategy

The researchers performed a systematic review and meta-analysis of RCTs that assessed the effects of MD on systolic BP (SBP) and diastolic BP (DBP). This review followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines,⁸ an assessment tool that helps ensure the quality of systematic reviews and meta-analyses.⁹ The searches were performed for literature published up to March, 2015. The authors accessed PubMed and Scopus using the search terms Mediterranean diet or Mediterranean diet score or Mediterranean diet pattern or Mediterranean food pattern or Mediterranean diet index AND hypertension or essential hypertension AND low fat diet AND adults AND randomized controlled trial or controlled clinical trial. The search strategy was adapted to each database methodology. No language or time restriction was applied. In addition, the reference list of the retrieved articles was searched to find other relevant articles.

Selection of Articles

Articles were considered eligible for inclusion if they were RCTs performed in adults and humans and if they examined the effect of MD on BP. Main outcomes of interest were mean and SD changes in systolic and diastolic BP in the MD study population groups and in the LFD study population groups, where the latter was employed as a control. To be included, the studies had to have lasted at least 12 months.

Exclusion criteria were studies conducted in animals; nonprimary studies (eg, letters and narrative literature reviews); duplicate publications; studies in which the MD to BP relationship was not reported or they were reported using estimators different from those

used in the current analysis (mean difference and 95% confidence interval [CI]); studies with a period of intervention lower than 12 months; studies that investigated the effects of the MD on BP in terms of macronutrients; studies that used as a control group different kinds of diet other than one low in fat (rich in protein or in carbohydrate); studies published before 2000; and studies whose intervention was only an education program.

Two reviewers (BRV and MN) independently screened titles and abstracts obtained from the search strategy for eligibility. Discrepancies were discussed and resolved before screening the remaining references. The articles were included only when both reviewers agreed that titles and abstracts met the inclusion criteria. When a title and abstract could not be included with certainty, the full text of the article was obtained and then further evaluated. After the initial screening process, full-text articles were obtained. The procedure for the identification, selection of articles, and data extraction is illustrated in Figure 1.

Data Extraction

Data were extracted from each study and organized using a standard form. When necessary, data were requested from the authors. The data extracted were the name of first author, year of publication and country where the study was conducted, number of participants, duration of the intervention, type of intervention diet and control diet, mean and SD values of the SBP and DBP in the intervention group and in the control group, changes within the intervention group from baseline to the end of the intervention, and changes between the intervention vs the control groups at 24 months or earlier. Finally, the 95% CI and SE of change for each study were reported.

Assessment of Risk of Bias in Included Studies

To evaluate the quality of the studies, the risk of bias was assessed following internal validity indicators regarding RCT methodology. Items collected during data extraction were: (1) method of

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