



The effect of whole grain intake on biomarkers of subclinical inflammation: a comprehensive meta-analysis of randomized controlled trials

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Abstract

Findings on the effect of whole grain consumption on inflammatory biomarkers are conflicting. This study aimed to summarize available studies on the effects of whole grain consumption on inflammatory biomarkers in adults. Online databases including PubMed, Scopus, ISI Web of Science, EmBase and Google scholar were searched for relevant studies published up to Jan 2018, using relevant keywords. We included randomized clinical trials investigating the effect of whole grain foods or diets high in whole-grain foods on markers of inflammation. Studies were selected if they had a control diet low in whole grains or diets without whole grains, whether calorie restricted or not. We did not include studies that examined the effect of individual grain components, including bran or germ, or fiber-based diets. Overall, 14 randomized clinical trials (RCTs), with 1238 individuals aged ≥ 18 y, were included. Pooling 13 effect sizes from 11 RCTs on serum C-reactive protein (CRP) concentrations, we found no significant effect of whole grain consumption on serum CRP concentrations (weighted mean difference (WMD): -0.29 mg/L, 95% CI: -1.10, 0.52 mg/L). However, the beneficial effects of whole grain intake on serum CRP concentrations were observed in studies done on individuals with elevated serum levels of CRP and studies with isocaloric diets. Combining 11 effect sizes from 10 RCTs, we found no significant effect of whole grain consumption on serum IL-6 concentrations (WMD: -0.08, 95% CI: -0.27, 0.11 mg/L). Nevertheless, we observed a significant effect of whole grain consumption on serum IL-6 concentrations in studies done on unhealthy individuals. A non-significant effect of whole grain intake on circulating serum TNF- α concentrations was also seen when we summarized effect sizes from 7 RCTs (WMD: -0.06, 95% CI: -0.25, 0.14 mg/L). Such a non-significant effect was observed for serum levels of plasminogen activator inhibitor-a (PAI-1) (WMD: -3.59, 95% CI: -1.25, 8.44 mg/L). Unlike observational studies, we found no significant effect of whole grain consumption on serum levels of inflammatory cytokines, including serum levels of CRP, IL-6, TNF- α , and PAI-1. However, beneficial effects of whole grains were found in some subgroups. Given the high between-study heterogeneity, deriving firm conclusions is difficult.

Keywords: “whole grains”; “diet”; “inflammation”; “meta-analysis”; “clinical trials”