

Vitamin D3 supplementation and blood pressure: a meta-analysis

Hypertension is a chronic condition that can lead to renal disease, cardiovascular disease, stroke and mortality. Vitamin D plays an important role in regulation of calcium and bone homeostasis and associated with mortality, type 2 diabetes, metabolic syndrome, cardiovascular disease and renal disease. Previous cross-sectional and cohort studies have shown an inverse association between 25-hydroxyvitamin D concentration and blood pressure however, randomized clinical trials (RCTs) of vitamin D3 supplementation (VD3S) effects on blood pressure have generated inconsistent results. Consequently, a meta-analysis is required.

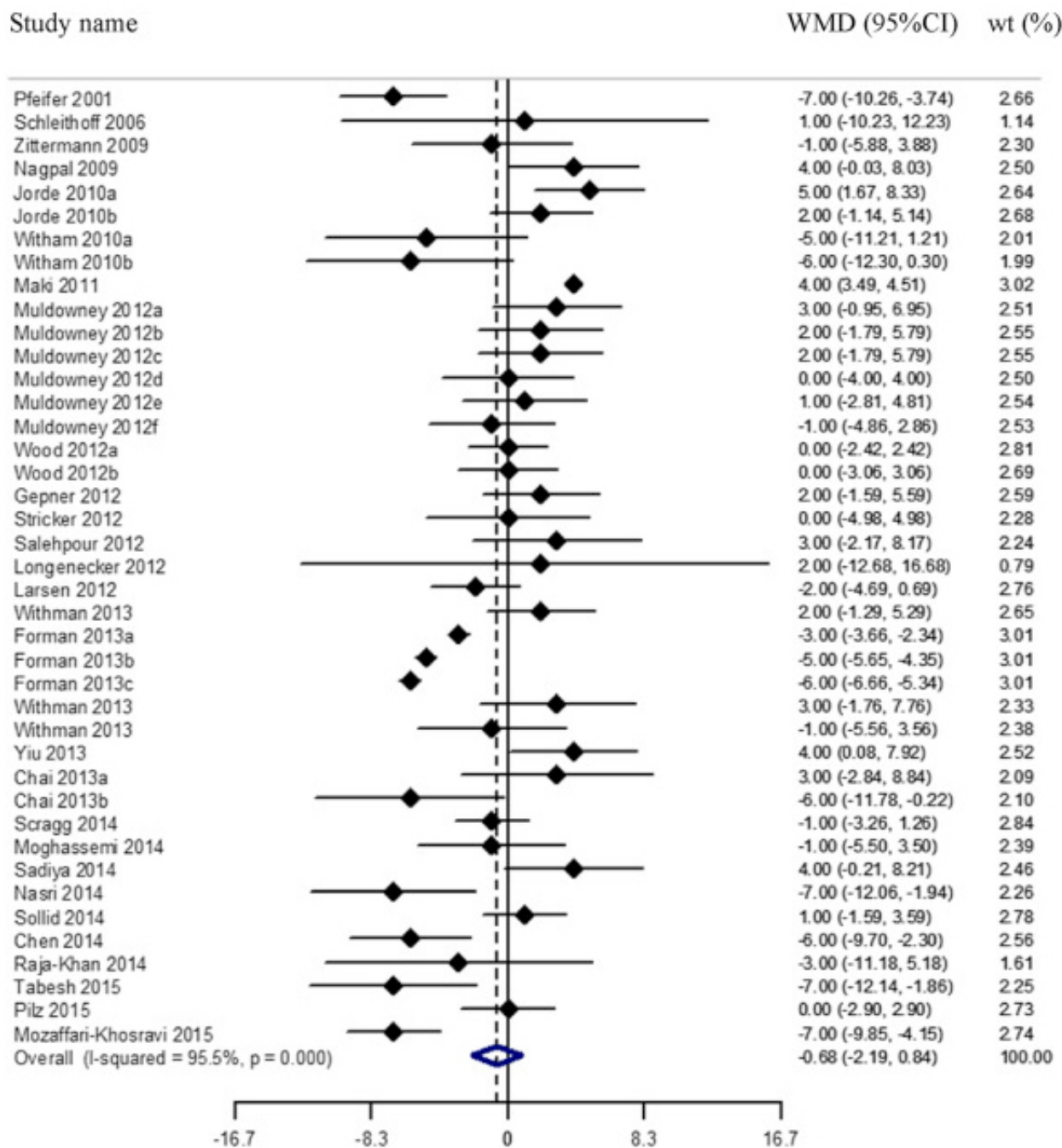


Fig. 1. Forest plot of effect of vitamin D3 supplementation on systolic blood pressure.

We aimed to evaluate the effect of VD3S on systolic and diastolic blood pressure in a meta-analysis. Literature searches of PubMed, Scopus, Ovid and Google scholar for publications in English were conducted up to April 2015. The following key words were used for studies pertinent

to the study objectives: (("Cholecalciferol"[Mesh] OR Vitamin D3 supplementation [title/abstract]) OR (vitamin d3[title/abstract] AND supplementation[title/abstract])) AND (("Hypertension"[Mesh] OR "blood pressure"[Mesh]) OR (hypertens*[title/abstract])). RCTs which assessed the effect of VD3S on systolic and diastolic blood pressure were selected. Studies were eligible for inclusion if: a) the study design was a RCT, b) the intervention was oral VD3S, c) the outcomes of interest were SBP and DBP, d) the population of interest was adults (aged >18 years). Trials which compared VD3S vs. placebo, or used VD3S in combination with calcium vs. calcium, were included. We screened 700 published articles which passed the initial inclusion criteria, of those 30 studies with 41 arms (including 4744 participants) were included in the meta-analysis.

The forest plots for the effects of VD3S on SBP and DBP are presented in Figures 1 and 2. Overall there was no significant reduction in SBP (-0.68 mmHg, 95%CI: -2.19 to 0.84) and DBP (-0.57 mmHg, 95%CI: -1.36 to 0.22) after intervention. VD3S had no significant effect in changes of SBP and DBP from baseline between men and women. VD3S significantly reduced SPB by on average -1.51 mmHg and DBP by -1.10 mmHg in adults aged 50 years and older. There were significant reductions in SBP (-1.40 mmHg) and DBP (-1.17 mmHg) in those studies which used >800 IU/d. VD3S alone decreased SBP by -3.60 mmHg and DBP by -1.97 mmHg. However, VD3S in combination with calcium supplementation significantly elevated SBP by 3.64 mmHg and DBP by 1.71 mmHg. In studies with durations ≥6 months, SBP (-1.51 mmHg) and DBP (-1.23 mmHg) were significantly decreased. Daily use of VD3S significantly reduced SBP by -1.41 mmHg and DBP by -1.18 mmHg. VD3S significantly reduced SBP and DBP in healthy adults (-3.96 mmHg and -2.23 mmHg, respectively) and hypertensive patients (-3.47 mmHg and -1.67 mmHg, respectively). In contrast it significantly increased SBP and DBP in overweight/obese subjects by 3.91 mmHg and 1.82 mmHg, respectively. After exclusion of studies were conducted on obese and overweight subjects, VD3S significantly decreased SBP by -3.73 mmHg and DBP by -2.01 mmHg. Findings from meta-regression analysis showed that there was no relationship between changes in SBP and baseline SBP, age in years, dose of VD3S and duration of intervention. No significant relationships between changes in DBP and baseline DBP, age, dose of VD3S and duration of intervention were found. No publication bias was found among studies.

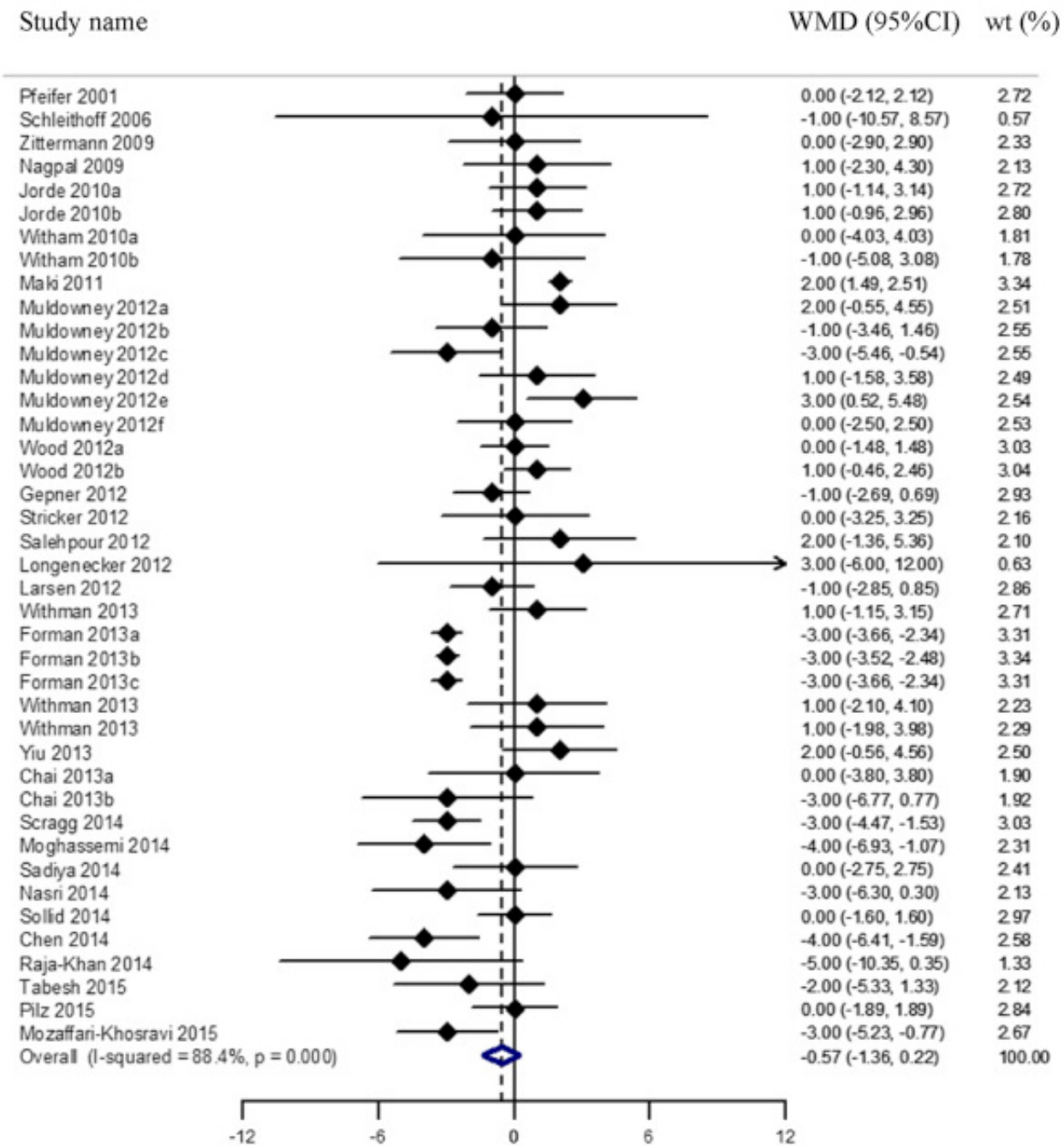


Fig. 2. forest plot of effect of vitamin D3 supplementation on systolic blood pressure.

The overall results of our meta-analysis have indicated that VD3S has variable impact on hypertension. Daily VD3S with a dose >800 IU/d or during