

Association of Magnesium with Mortality in CKD and ESRD

A Systematic Review and Meta-analysis of Cohort Studies

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OBJECTIVES

Magnesium has essential roles in a variety of physiological functions within human cells. Previous studies reported that magnesium deficiency is associated with vascular calcifications, atherosclerosis and cardiovascular disease. Additionally, magnesium deficiency is associated with cardiovascular disease and risk of death in CKD and ESRD patients. However, the results of these studies are controversial.

METHODS

We performed a systematic review and meta-analysis to evaluate the association between dysmagnesemia with mortality risk in CKD and dialysis patients. Literature were identified by searching MEDLINE, Embase, and PubMed database from date of inception to November 2016. The primary outcome was the all-cause and cardiovascular mortality. We pooled unadjusted and adjusted hazards ratios (HRs) with 95% confidence intervals (95% CIs).

RESULTS

We identified 18 cohort studies involving 200,443 participants that met our inclusion criteria and were included in the meta-analysis. The results show that there is a strong association between hypomagnesemia and the risk of all-cause mortality in CKD and ESRD patients (HR, 1.71; 95%CI, 1.34-2.19; $p < 0.001$) (dichotomous variables). Multivariate analysis also showed there was a strong association between hypomagnesemia and all-cause mortality in CKD and ESRD patients (HR, 1.35; 95% CI, 1.19-1.54; $p < 0.001$) (dichotomous variables). We found that hypermagnesemia was inversely associated with all-cause mortality in CKD and ESRD patients, and the HR was 0.54 (95%CI, 0.39-0.75; $p < 0.001$) (continuous variable) and 0.86 (95% CI, 0.79-0.94; $p = 0.001$) (continuous variable) for unadjusted and multivariate adjusted data, respectively. We also found a significant association between hypermagnesemia and a decreased risk of cardiovascular mortality (HR, 0.71; 95%CI, 0.53-0.97, $p = 0.03$) after multivariate analysis. In addition, we performed a subgroup analysis and found that hypomagnesemia was strongly associated with increased mortality (HR, 1.34; 95%CI, 1.10-1.62; $p = 0.003$) (dichotomous variables) in hemodialysis patients.

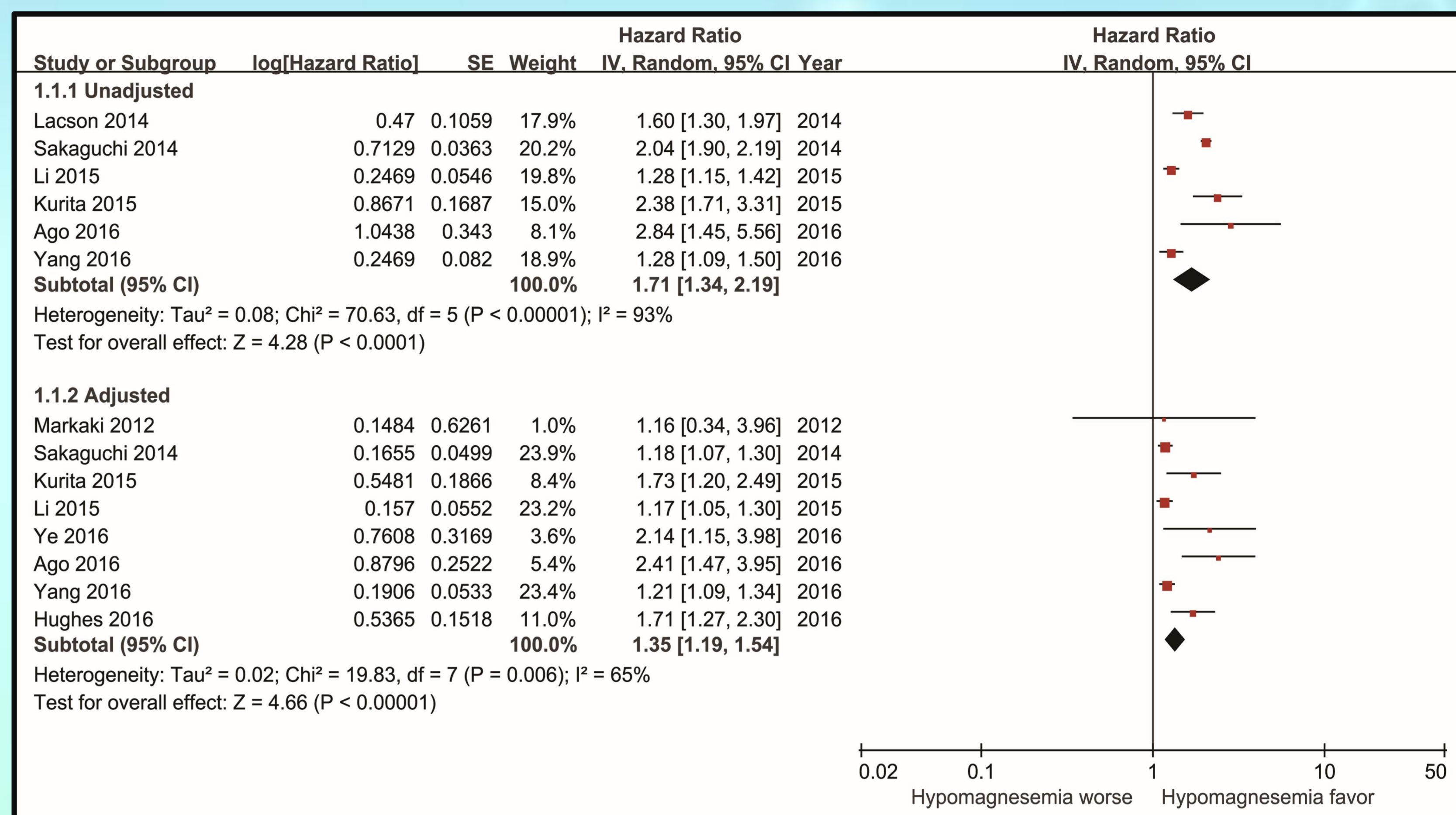


Figure 1. The association between hypomagnesemia and all-cause mortality

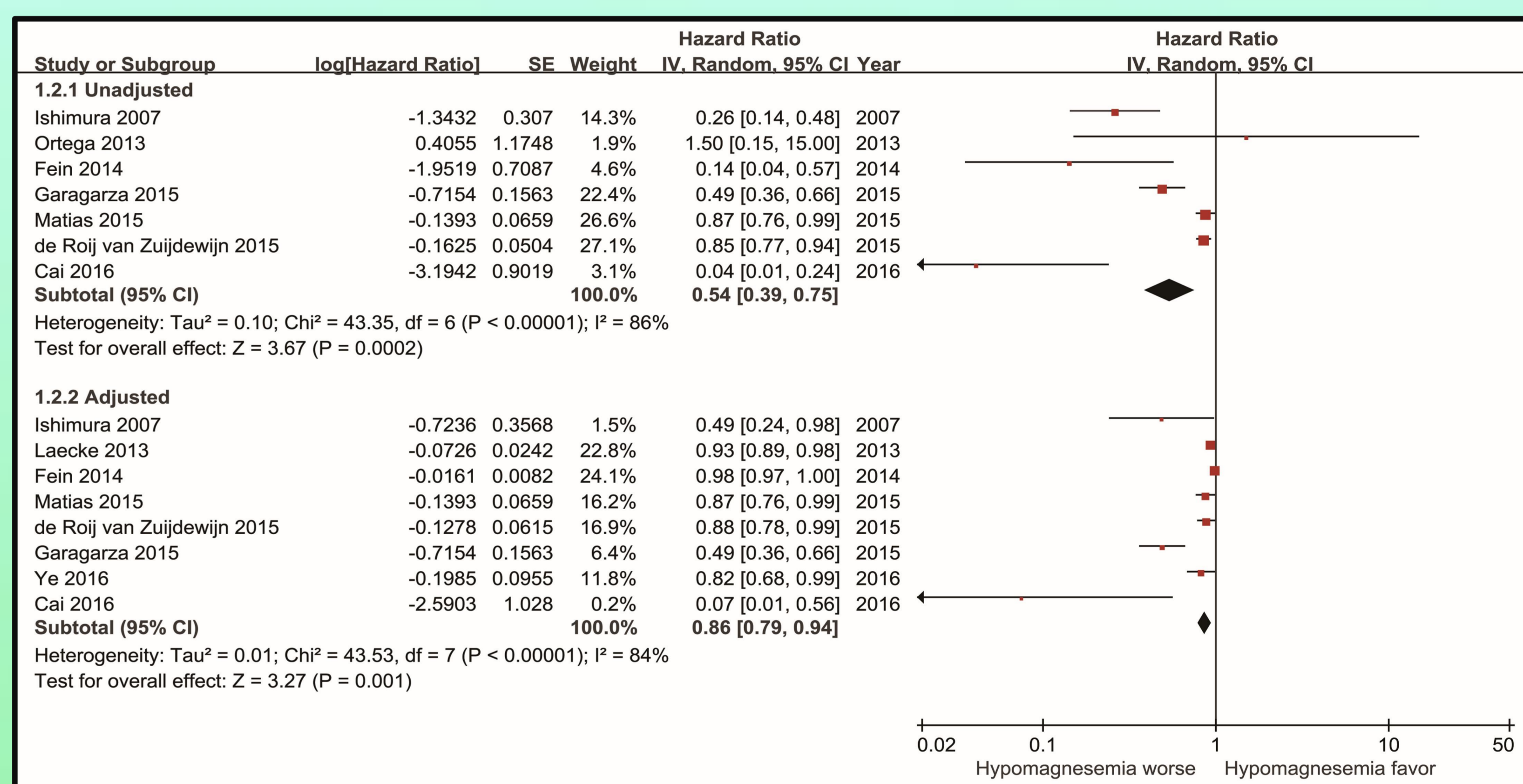


Figure 2. The association between hypermagnesemia and all-cause mortality

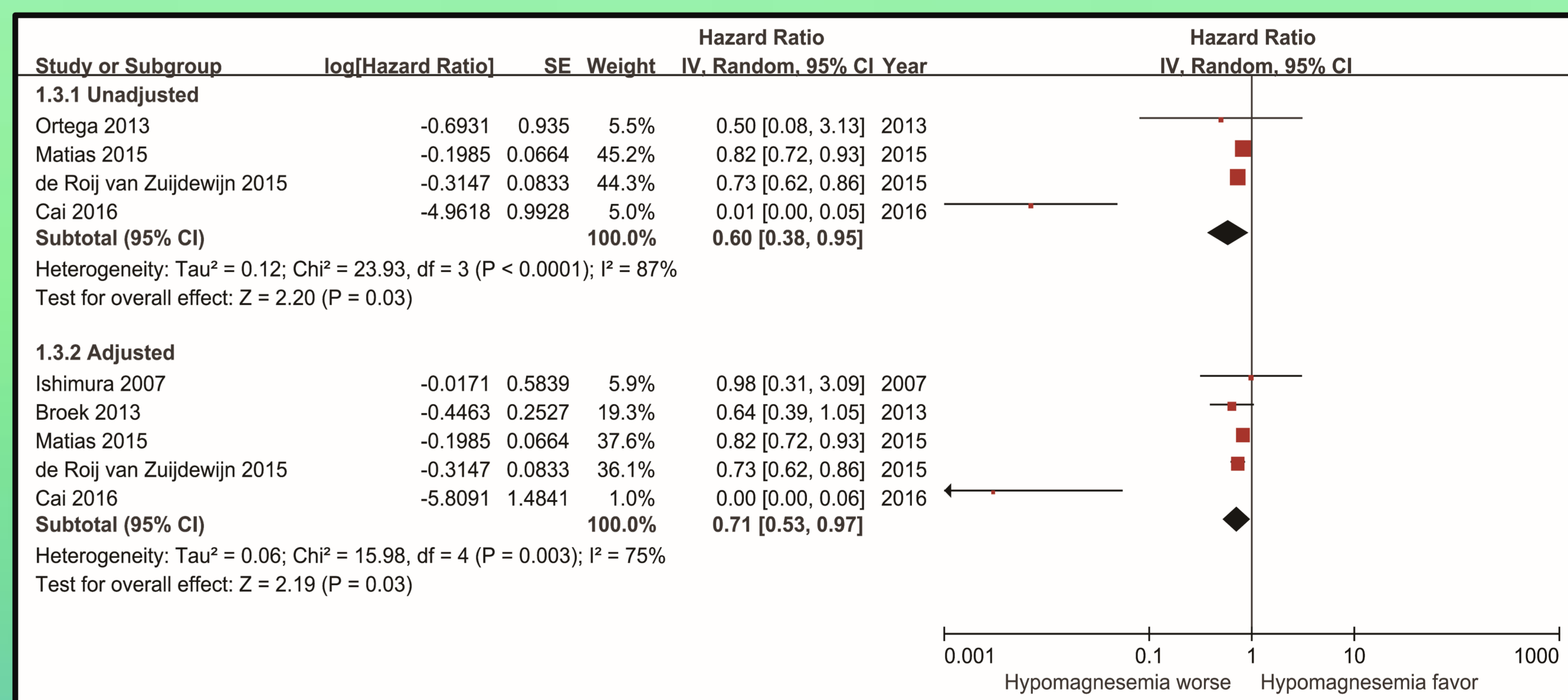


Figure 3. The association between magnesium and cardiovascular mortality

CONCLUSIONS

Magnesium disturbance is significantly associated with risk of cardiovascular and all-cause mortality in CKD and ESRD patients. It is currently unclear if patients can benefit from magnesium correction, and additional prospective studies are needed to confirm our conclusions.

