

ORIGINAL RESEARCH

Does consuming ascorbate-rich fruits and fruit juices with meals improve iron bioavailability?: A systematic review and meta-analysis of interventions

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Abstract

Background: This systematic review summarizes the effect of consuming ascorbate-rich fruits or fruit juices with meals on iron bioavailability. **Methods:** We carried out a systematic review and meta-analysis of interventions. Searches were conducted in December 2024 in Scopus, Ovid Medline, ClinicalTrials.gov, Cochrane Controlled Register of Trials (CENTRAL), and WHO International Clinical Trials Registry Platform (ICTRP). Randomized controlled trials and controlled clinical trials were considered, with main outcomes being iron absorption and serum ferritin among women of childbearing age and children. Two independent reviewers were involved in screening titles and abstracts, full texts, extracting data, assessing risk of bias, and GRADE assessment. Conflicts were resolved through discussions to reach a consensus. **Results:** After screening 2400 unique records, 18 met the inclusion criteria. The main vitamin C-rich fruits used as interventions were oranges and guavas. Including ascorbate-rich fruits in meals had a positive effect on iron absorption (mean difference, MD = 3.36% $\mu\text{g/L}$, 95% CI: -0.29 to 7.00; $p = 0.07$), serum ferritin (MD = 9.39 $\mu\text{g/L}$, 95% CI: 5.38 to 13.40; $p < 0.001$), haemoglobin (MD = 1.34 $\mu\text{g/L}$, 95% CI: 0.33 to 2.35; $p = 0.01$), and iron balance (MD = 2.4, 95% CI: 1.42 to 3.38), serum transferrin receptor (MD = 0.37 mg/L , 95% CI: -0.50 to -0.24; $p < 0.00001$). There was no impact on plasma ferritin (MD = -0.11 $\mu\text{g/L}$; 95% CI: -1.09 to 0.86; $p = 0.82$), and body iron stores (-0.29 mg/kg body weight, 95% CI: -0.85 to 0.28; $p = 0.32$). **Conclusion:** Consuming vitamin C-rich fruits and fruit juices with meals may positively influence iron absorption, serum ferritin levels, haemoglobin levels, serum transferrin receptors, and iron balance among women of childbearing age and children.

Keywords: iron bioavailability, ascorbate-rich fruits, haemoglobin, enhancers, maternal and child nutrition