



Effects of Vitamins C and E on Endothelial Function: Systematic Review & Meta-analysis of randomised controlled trials

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Endothelial dysfunction is caused by excessive free radical production and nitric oxide (NO) inadequacy. Endothelial dysfunction is the primary cause of vascular disorders and is related to the progression of clinical complications⁽¹⁾. Human trials examining the effects of antioxidant vitamins on endothelial function (EF) showed inconclusive results^(2,3). We undertook a systematic review and meta-analysis of the evidence from randomised controlled trials (RCTs) for effects of supplementation with vitamins C and E on EF.

We searched the Medline, Embase, Scopus and the Cochrane Library databases for studies that met the following criteria: 1) RCTs with adult participants, 2) vitamin C or E administered alone or in combination, 3) studies that quantified EF using forearm blood flow or flow mediated dilation. EF responses across studies were pooled as standardised mean differences and analysed using a random-effects model using STATA 12 (StataCorp. 2011. College Station, TX, USA).

Meta-analysis showed a significant improvement in EF in trials supplementing with vitamins C (SMD: 0.25, 95% CI: 0.02, 0.49, $P = 0.043$) and E (SMD: 0.48, 95% CI: 0.23, 0.72, $P = 0.0001$) alone whereas the co-administration of both vitamins was ineffective (SMD: 0.12, 95% CI: -0.18, 0.42, $P = 0.428$). The effect of vitamin C on EF increased with participant age (β : 0.023, CI: 0.001, 0.05, $P = 0.042$). There was a significant negative correlation between baseline plasma vitamin E concentration and the EF response to vitamin E (β : -0.03, CI: -0.06, -0.001, $P = 0.029$). Separate supplementation with vitamins C and E improves EF. Furthermore, subgroup analysis emphasises the importance of careful selection of the population group which may benefit from such supplementation.

1. Vanhoutte PM, Shimokawa H, Tang EH *et al.* (2009). *Acta Physiol (Oxf)* **196**, 193–222.

2. Darko D, Dornhorst A, Kelly FJ *et al.* (2002). *Clinical Science* **103**, 339–344.

3. Plantinga Y, Ghiadoni L, Magagna A *et al.* (2007). *American Journal of Hypertension* **20**, 392–397.