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Associations of vitamin E intake and plasma α-tocopherol concentration with bone density status

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Nutrition is a modifiable factor with significant effects on bone health[(1)]. Vitamin E is an anti-oxidant and anti- inflammatory agent and may therefore be of benefit to diseases associated with low-grade chronic inflammation, such as osteoporosis[(2)]. This study aimed to investigate the potential associations of dietary vitamin E intake (mg α-tocopherol equivalents) and plasma α-tocopherol concentration, adjusted for total cholesterol, with bone density status.

Dietary vitamin E intake was assessed at a baseline health examination (1HE) between 1993 and 1997, using 7 day food diaries, in participants from the EPIC-Norfolk cohort study[(3)]; non-fasting serum cholesterol and plasma α-tocopherol concentrations were also measured at this time-point. At a second health examination, (2HE), broadband ultrasound attenuation (BUA) of the calcaneus (heel bone) was measured, which was used to indicate bone density status. Data collected via two self-administered Health and Lifestyle Questionnaires (HLQ1 and HLQ2), before the 1HE and 2HE respectively, were used to establish classification of a number of variables. Analyses were conducted on sub-samples with measures of BUA and dietary vitamin E intake (6,443 men and 8,251 women, aged 39–79 y) and BUA and cholesterol-adjusted plasma α-tocopherol concentration (2,308 men and 2,149 women, aged 42–82 y). Analysis of covariance and linear regression were used to study associations of BUA across sex-specific quintiles of dietary vitamin E intake (adjusted for age, BMI, total energy, dietary calcium intake, smoking status, physical activity, corticosteroid use, calcium and vitamin D supplement use and family history of osteoporosis and menopausal status and HRT use in women), and also across sex-specific cholesterol-adjusted plasma α-tocopherol concentration (adjusted for age, BMI, smoking status, physical activity, corticosteroid use and family history of osteoporosis, and menopausal status and HRT use in women).

In both men and women, mean BUA tended to significantly increase across both quintiles of dietary vitamin E intake and cholesterol-adjusted plasma α-tocopherol concentration ($P < 0.001$). The differences between Q1 and Q5 for BUA across dietary vitamin E and cholesterol-adjusted plasma α-tocopherol concentration quintiles were 1.2% and 1.3% in men and 0.8% and 2.1% in women, respectively. A significant difference was identified across quintiles of dietary vitamin E in men only, for Q3 vs Q1 (+1.8%; $P < 0.05$) but no significant differences were found between quintile 1 and any of the other quintiles in the cholesterol-adjusted plasma α-tocopherol concentration model.

This study provides evidence that dietary vitamin E intake, confirmed by circulating concentrations of α-tocopherol, is beneficial to adult bone density status, in middle- and older-aged men and women. Further investigation is required to ascertain whether similar associations exist with osteoporotic fracture risk in this cohort.

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