

No effect of vitamin D supplementation on circulating concentrations of matrix metalloproteinase-9 (MMP-9) and tissue inhibitor of metalloproteinases-1 (TIMP-1) in adults aged 20–40 and ≥64 years

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Tissue matrix metalloproteinases participate in extracellular matrix remodelling and degradation. Increased expression of MMP-9 and its inhibitor TIMP-1 are linked to unfavourable cardiovascular conditions, including inflammatory damage leading to increased plaque instability⁽¹⁾. Vitamin D insufficiency is associated with higher MMP-9 concentrations, while vitamin D supplementation has been shown to decrease circulating MMP-9 and TIMP-1 concentrations in vitamin D-deficient adults⁽²⁾.

The effect of vitamin D supplementation (0, 5, 10 and 15 µg cholecalciferol/d) on MMP-9 and TIMP-1 concentrations was investigated in two randomised placebo-controlled double-blind 22-week intervention studies in men and women aged 20–40 years (*n* 215; during winter 2006–7⁽³⁾) and ≥64 years (*n* 215; during winter 2007–8⁽⁴⁾) from Cork and Coleraine. Fasting serum levels of MMP-9, TIMP-1 and 25-hydroxyvitamin D (25(OH)D) were measured by ELISA at baseline and end point.

| | Treatment group (µg cholecalciferol/d) | | | | | | | | | | | | | | | | <i>P</i> |
|-------------------|--|-----|-------------------|-----|--------|-----|-------------------|-----|--------|-----|-------------------|-----|--------|-----|-------------------|-----|-----------------------|
| | Placebo | | | | 5 | | | | 10 | | | | 15 | | | | |
| | BL | | EP | | BL | | EP | | BL | | EP | | BL | | EP | | |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | |
| 20–40 years | (n 56) | | | | (n 50) | | | | (n 57) | | | | (n 52) | | | | |
| MMP-9 (ng/ml) | 237 | 175 | 187 | 147 | 222 | 177 | 183 | 150 | 242 | 200 | 197 | 166 | 238 | 17 | 210 | 185 | 0.381 |
| TIMP-1 (ng/ml) | 158 | 34 | 156 | 38 | 167 | 37 | 159 | 41 | 161 | 39 | 152 | 37 | 171 | 39 | 155 | 39 | 0.441 |
| 25(OH) D (nmol/l) | 76.8 | 33 | 41.8 ^a | 18 | 71.3 | 27 | 53.4 ^b | 15 | 77.6 | 33 | 62.1 ^c | 22 | 79.7 | 30 | 72.4 ^d | 21 | <0.001 ⁽³⁾ |
| ≥64 years | (n 56) | | | | (n 51) | | | | (n 57) | | | | (n 51) | | | | |
| MMP-9 (ng/ml) | 205 | 189 | 251 | 233 | 188 | 192 | 211 | 203 | 197 | 206 | 196 | 187 | 180 | 172 | 229 | 228 | 0.603 |
| TIMP-1 (ng/ml) | 178 | 42 | 186 | 43 | 186 | 49 | 188 | 54 | 182 | 48 | 175 | 42 | 187 | 37 | 185 | 41 | 0.815 |
| 25(OH) D (nmol/l) | 58.9 | 23 | 43.1 ^a | 17 | 57.9 | 23 | 58 ^b | 16 | 59.2 | 26 | 70.6 ^c | 18 | 53.73 | 18 | 76.2 ^c | 21 | <0.001 ⁽⁴⁾ |

BL, baseline; EP, end point (EP). Means in a row with unlike superscript letters were significantly different (*P*<0.001).

ANOVA showed no baseline differences in the circulating concentrations of MMP-9, TIMP-1 or 25(OH)D between the four treatment groups. Baseline MMP-9 and TIMP-1 concentrations were significantly higher in adults aged 20–40 years (*P*<0.001) and adults aged ≥64 years (*P*<0.01) in Coleraine than in Cork. Linear regression analysis showed study centre to be the main predictor of MMP-9 (adjusted *R*² 0.474; *P*<0.001) and TIMP-1 (adjusted *R*² 0.326; *P*<0.001) concentrations in adults aged 20–40 years. In both age-groups pre- and post-intervention 25(OH)D concentrations were not associated with levels of MMP-9, TIMP-1 or MMP-9:TIMP-1. In both age-groups repeated measures analysis revealed no significant effect of the intervention on MMP-9 and TIMP-1 concentrations across the four groups, adjusting for centre, age, gender and BMI.

In conclusion, vitamin D supplementation had no effect on circulating MMP-9 and TIMP-1 concentrations in apparently-healthy adults aged 20–40 and ≥64 years.

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