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Vitamin D deficiency negatively affects total bone mineral density in adult Brazilian women living in Southern England: baseline results of the D-SOL study

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Vitamin D deficiency, defined as 25-hydroxyvitamin D (25(OH)D) serum concentrations below 25 nmol/l, may reduce calcium absorption resulting in a defect in bone matrix mineralization that leads to rickets in children and osteomalacia/osteoporosis in adults. Low 25(OH)D serum concentrations have been associated with low bone mineral density and risk of fractures[1]. The D-SOL study (A Systems Biology Approach to the Interaction between Vitamin **D** Supplementation and **S**unlight Exposure in Brazilian Women living in **O**pposite **L**atitudes) involves two parallel vitamin D randomised controlled trials, one held in the UK and the other in Brazil, with identical study designs.

This cross sectional sub-analysis aimed to investigate the association between vitamin D status and bone health parameters in Brazilian women living in Southern England and included 51 Brazilian women aged 20–59 years recruited for the D-SOL UK RCT arm in December 2016. Radial bone geometry and density were measured using peripheral quantitative computed tomography (pQCT) at diaphyseal (66 %) and distal (4 %) sites. Serum 25(OH)D concentration was measured by liquid chromatography tandem mass spectrometry.

At baseline, mean vitamin D status was 35·12 ± 15·11 nmol/l, with 27·5 % of the women below the vitamin D deficiency cut-off of 25 nmol/l[2]. A total of 54·9 % of the women had vitamin D levels below 50 nmol/l, which is defined as 'vitamin D inadequacy' by the US Institute of Medicine[3]. Women with vitamin D deficiency had significantly lower total volumetric bone mineral density (vBMD) ($p = 0{\cdot}015$) and cortical vBMD ($p = 0{\cdot}03$) at the diaphyseal site than those presenting vitamin D inadequacy. Deficient women also showed significantly lower total vBMD at the diaphyseal site than those with levels above 50 nmol/l ($p = 0{\cdot}047$). There were no significant differences between women with inadequate levels and those with levels above 50 nmol/l, for any of the bone measurements. After controlling for weight and age, these differences persisted for total vBMD (ANCOVA $p = 0{\cdot}039$), but not for cortical vBMD ($p = 0{\cdot}145$). There were no significant differences in other pQCT measurements between the three vitamin D status groups.

This study has shown that women with serum 25(OH)D concentrations below 25 nmol/l have poorer total vBMD than those with higher levels, being in accordance with the most accepted minimum threshold for vitamin D levels of 25 nmol/l to prevent detrimental effects to bone health, with findings independent of body size. The specific nutrient:gene/endocrine interactions and how these concomitantly affect vitamin D metabolism and bone health indices will be explored further within each country cohort. The D-SOL Study will provide valuable insights into the specific predictors and requirements to prevent vitamin D deficiency for Brazilian women living abroad and in their native country.

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