

## Calculation of free and bioavailable vitamin D and its association with bone mineral density in Malaysian women with rheumatoid arthritis

### ABSTRACT

**Introduction:** Low 25-hydroxyvitamin D [25(OH)D] levels have not been consistently associated with bone mineral density (BMD). It has been suggested that calculation of the free/bioavailable 25(OH)D may correlate better with BMD. We examined this hypothesis in a cohort of Malaysian women. **Materials and Methods:** A cross-sectional study of 77 patients with rheumatoid arthritis (RA) and 29 controls was performed. Serum 25(OH)D was measured using the Roche Cobas E170 immunoassay. Serum vitamin D binding protein (VDBP) was measured using a monoclonal enzymelinked immunosorbent assay (ELISA). Free/bioavailable 25(OH)D were calculated using both the modified Vermuelen and Bikle formulae. **Results:** Since there were no significant differences between RA patients and controls for VDBP and 25(OH)D, the dataset was analysed as a whole. Calculated free 25(OH)D by Vermeulen was strongly correlated with Bikle ( $r = 1.00$ ,  $p < 0.001$ ). A significant positive correlation was noted between measured total 25(OH)D with free/bioavailable 25(OH) D ( $r = 0.607$ ,  $r = 0.637$ , respectively,  $p < 0.001$ ). Median free/bioavailable 25(OH)D values were significantly higher in Chinese compared with Malays and Indians, consistent with their median total 25(OH)D. Similar to total 25(OH)D, the free/bioavailable 25(OH)D did not correlate with BMD. **Conclusion:** In this first study of a multiethnic female Malaysian population, free/bioavailable 25(OH)D were found to reflect total 25(OH)D, and was not superior to total 25(OH)D in its correlation with BMD. Should they need to be calculated, the Bikle formula is easier to use but only calculates free 25(OH)D. The Vermuelen formula calculates both free/bioavailable 25(OH)D but is more complex to use.

**Keyword:** Free/bioavailable 25-hydroxyvitamin D [25(OH)D]; Bone mineral density (BMD); Vitamin D binding protein (VDBP)