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### Editorial Comment

## Associations between Vitamin Deficiency and Bone Mineral Density in Elderly Patients

In Taiwan, osteoporosis prevalence increased from 17.4% in 2001 to 25.0% in 2011. Osteoporosis is associated with age-related fractures and has been recognized as a major public health issue.<sup>1</sup> In elderly people, several factors, including vitamins, are associated with bone mass loss.<sup>2</sup> Aging adults tend to eat less due to decreased appetite and activity levels. This can result in vitamin and mineral deficiencies. These dietary deficiencies have been linked to osteoporosis.

Vitamins are essential for well-being as they have different functions in cell growth and development. Vitamin D is important for bone health.<sup>3</sup> However, other vitamins such as B2, B6, B12, and folate are also related to bone mineral density (BMD).<sup>4</sup>

Elderly individuals tend to have vitamin B2 (riboflavin) deficiencies due to aging and reduced efficiency of absorption. Evidence about the relationship between vitamin B2 and bone health is scarce but important. In a cohort of elderly whites, low dietary riboflavin levels increased fracture risks in postmenopausal women.<sup>5</sup> Studies relating B6 (pyridoxine) to bone health or fracture risk are also limited. Some studies have revealed independent roles of B6 in bone mass and/or fracture risk. Low dietary B6 intake may be associated with low BMD and high fracture risk.<sup>4</sup> Vitamin B12 is an essential dietary nutrient in humans.<sup>6</sup> Low vitamin B12 and folate levels have been associated with deteriorating bone health.<sup>7</sup> In elderly people, a relationship has been shown between serum B12 concentrations and BMD.<sup>6</sup> In a systemic review of 17 studies on vitamin B12, BMD, and fracture risk, the real effect of vitamin B12 deficiency on bone health has not yet been established, however, some studies have reported associations of vitamin B12 levels with fracture risk and/or BMD.<sup>2</sup> Some evidence supports a significant positive association of folate levels with lumbar/vertebral or hip BMD. Some studies reported no significant relationships between serum or plasma folate levels and BMD of any bone region among older females.<sup>8</sup>

Some vitamins are essential for bone health. In addition to vitamin D, vitamins such as B2, B6, B12, and folate maybe also be related to BMD. Additionally, the relationship between vitamins and BMD should be further elucidated.

### References

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