



# Commentary on “Low serum 25-hydroxyvitamin D level is associated with obesity and atherogenesis in adolescent boys”

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Vitamin D deficiency is a major public health concern in children and adolescents.<sup>1)</sup> Based on a definition of vitamin D deficiency and insufficiency of <20 ng/mL and <30 ng/mL serum 25-hydroxyvitamin D<sub>3</sub> (2(OH)D<sub>3</sub>) concentrations, respectively,<sup>2)</sup> the prevalence of vitamin D deficiency was 15% of the pediatric population in the United States.<sup>3)</sup> In Korea, over one-third of children aged 1–15 years have vitamin D deficiency, and 90% or more of children and adolescents have vitamin D deficiency or insufficiency; this might result from lifestyle changes with increasing screen-time, sunscreen use,<sup>4)</sup> decreasing outdoor physical activity, and insufficient vitamin D intake.<sup>1)</sup>

The role of vitamin D in bone metabolic modulation is well established. Recent studies have also shown that vitamin D status is associated with infectious diseases, some cancers, autoimmune diseases, and diabetes mellitus, in addition to skeletal diseases.<sup>5)</sup> A few studies have revealed that vitamin D deficiency can increase the risk of cardiovascular complications and metabolic dysfunction such as obesity, hypertension, dyslipidemia, and hyperglycemia during childhood and adolescence.<sup>6)</sup> Moreover, a few meta-analyses have demonstrated that vitamin D supplementation may improve metabolic homeostasis and help promote general health.<sup>3,7,8)</sup>

The underlying pathophysiological mechanisms between low serum levels of vitamin D and obesity remain unclear. Some evidence has suggested that obesity may cause hypovitaminosis D due to volumetric dilution and sequestration in the adipose tissue, decreased cutaneous biosynthesis of vitamin D, and reduced expression of vitamin D-metabolizing enzymes. Conversely, low vitamin D may cause obesity due to regulation of adiposity-related genes and leptin, and vitamin D receptor gene polymorphism.<sup>9,10)</sup> However, most previous studies agree that weight reduction has only a weak benefit in terms of vitamin D level, and vitamin D supplementation does not affect body weight or body mass index, except for body fat distribution.<sup>9,10)</sup>

The results of this study provide evidence that low serum 25(OH)D<sub>3</sub> levels are positively associated with the risk of obesity and atherogenesis in Japanese adolescent boys, but not in girls.<sup>11)</sup> This sex difference was presumed to be related to body composition, sun exposure, puberty. A few studies also reported sex differences in vitamin D deficiency and vitamin D-driven improvements in testosterone.<sup>12)</sup> However, the mechanism of these sex differences remains unclear.

This study has some limitations. The authors did not evaluate participants' pubertal status, socio-economic conditions, physical activity, or nutritional status. These factors strongly influence weight balance and serum vitamin D level.

Further multicenter longitudinal investigations are needed to determine the relationship underlying serum vitamin D levels, metabolic derangements, and sex differences in children and adolescents, including confounding factors.

**Conflicts of interest:** No potential conflict of interest relevant to this article was reported.

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