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The effect of vitamin D₃ supplementation on vitamin D status and associated health outcomes in children

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Sufficient vitamin D status is required in childhood for normal skeletal health and the development of muscle and motor function⁽¹⁾. Vitamin D primarily acts through the promotion of calcium absorption from the gut and mobilisation from bone tissue⁽²⁾. Childrens' vitamin D dietary intakes are currently below the recommended guidelines within the UK and Ireland suggesting a need for vitamin D₃ supplementation to prevent the risk of developing vitamin D deficiency⁽³⁾. The aim of this study was to examine the effect of 12 weeks' supplementation with 10µg/d vitamin D₃ vs placebo control on vitamin D status and to determine if improved vitamin D status impacted muscle function and cognition in children aged 4–11 years.

In the D-VinCHI randomised, double-blind, placebo-controlled trial, healthy children (n = 118; mean age 8.1 ± 1.8 y; 51% girls) were randomly assigned to either placebo or 10µg/day of vitamin D₃ for 12 weeks (year-round). Baseline and endpoint measures included anthropometric measures, hand grip strength, balance, and cognitive assessment. Blood samples were analysed for plasma 25hydroxyvitamin D [25(OH)D], and parathyroid hormone. Vitamin D consumption from food sources was assessed via a 13-item food frequency questionnaire.

Following the 12-week intervention vitamin D status [25(OH)D concentration] increased in the treatment group from 66.31 ± 17.25 nmol/L to 69.04 ± 16.92 nmol/L. Change in status was significantly different compared to the placebo group within which a decrease in 25(OH)D was observed from 63.67 ± 19.48 to 56.29 ± 18.58 nmol/L, p<0.001. Supplementation with vitamin D₃ prevented deficiency of plasma 25(OH)D during the winter months. Vitamin D₃ supplementation had a positive effect on cognitive function, improving simple movement time from 707 ± 380 to 599 ± 207 milliseconds, compared to the placebo group within which time increased from 680 ± 284 to 728 ± 372 milliseconds, p = 0.017. Vitamin D mean dietary intake from food sources alone was 2.68µg/day. There was no effect of supplementation on muscle function.

Vitamin D₃ supplementation maintained year-round sufficiency in children and importantly, prevented deficiency during the extended winter months. Vitamin D supplementation may enhance cognitive function via improvements in attention and psychomotor speed. The reported intakes of vitamin D food sources were low and were well below the current dietary reference value for this age group. Further health promotion policies and (bio)fortification strategies should be considered within this age group to maximise vitamin D status for optimal growth and development.

References

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