



Preliminary associations between total circulating 25-hydroxyvitamin D concentrations and muscle health outcomes in children

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Vitamin D, through its role in calcium homeostasis, is required for bone health. Vitamin D deficiency is a global health problem with circulating 25-hydroxyvitamin D (25(OH)D) the main indicator of vitamin D status. In respect to bone health, the UK 25(OH)D thresholds are classed as: deficient (<25nmol/l), insufficient (25–50nmol/l) and sufficient (>50nmol/l)⁽¹⁾. At Northern latitudes, including the UK/Ireland, a lack of sunlight exposure during the extended winter months increases the risk of vitamin D deficiency therefore, reliance upon dietary sources of vitamin D is critical during this time. The most recent guidance from within Ireland recommends that children aged 5–11 years require 10µg/day vitamin D to minimise risk of deficiency⁽²⁾. Due to the role vitamin D has in extra-skeletal health outcomes, determining those at risk of insufficiency and deficiency at an early age may be health protective⁽³⁾. This study investigated associations between vitamin D status and muscle health in a child cohort.

Vitamin D status (plasma 25(OH)D) was determined using Liquid Chromatography Tandem Mass Spectrometry from samples collected between November 2019 - February 2023. Information from parent completed questionnaires documented sex and age. Anthropometric measurements including height (cm) and weight (kg) were taken to calculate body mass index (kg/m²). Muscle (hand-grip) strength (kg) was assessed by dynamometer. Balance was assessed by timed single leg stance and tandem stance, both with eyes open and closed (seconds). A Mann-Whitney U tests were conducted to assess differences in muscle strength and balance between sufficient and insufficient/deficient participants.

A total of 162 children aged 4 -11 years were enrolled between November 2019 and February 2023. The median (IQR) age was 8 (7) years and 47.6% were female. Median (IQR) height, weight, and BMI were 135.45 (56.70) cm, 30.08 (52.40) kg and 16.80 (18.50) kg/m² respectively. Median (IQR) 25(OH)D was 62.29 (92.70) nmol/L. Median (IQR) 25(OH)D was 22.84 (2.73) nmol/L in the deficient group (n = 3, 1.9%), 42.91 (24.72) nmol/l in the insufficient group (n = 48, 29.6%) and 68.13 (63.91) nmol/l in the sufficient group (n = 111, 68.5%). Median single leg stance eyes closed, and tandem leg stance eyes closed were significantly higher in children with sufficient vitamin D status compared to non-sufficient children (+1.8 seconds, $U = 3046.0$, $z = 2.174$, $p = 0.03$; +10.26 seconds, $U = 2995.0$, $z = 2.320$, $p = 0.02$), respectively. There was no significant difference in hand-grip strength, single leg, or tandem stance balance with eyes open between groups.

These preliminary results suggest that vitamin D sufficiency may be associated with improved balance in children, however, participation in balance-based sports may have influenced these results. Further research is warranted to elucidate these findings.

References

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