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Prevalence of vitamin D insufficiency and associations between 25(OH)D concentrations and health outcomes in children aged 4 – 11 years in the north of Ireland

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Optimal vitamin D status is important for growth and development during childhood[(1)]. Children with a circulating concentration of 25-hydroxyvitamin D [25(OH)D] below 25 nmol/L are at increased risk of rickets. In order to maintain 25(OH)D > 25nmol/L, a dietary intake of 10µg/d vitamin D is recommended for children aged 4 years and above[(2,3)]. The aim of this study was to determine vitamin D status in healthy children and to investigate associations between 25(OH)D concentrations and muscle health, cognitive function, and parental knowledge of vitamin D, vitamin D habits, perceptions, and practices.

A cross-sectional study of healthy children aged 4 – 11 years conducted between 2019 – 2023 examined vitamin D status by measuring plasma 25(OH)D via the gold standard liquid chromatography tandem mass spectrometry and parathyroid hormone concentrations. Muscle strength (hand grip and balance) was determined by dynamometer, single and tandem stance balancing whilst cognitive function was assessed using the Cambridge Neuropsychological Test Automated Battery. Parents completed questionnaires to assess vitamin D knowledge, and perceptions, habits, and attitude towards vitamin D.

A total of 192 children (91 boys; 101 girls) with an average age of 8.2 years were recruited. Plasma 25(OH)D concentrations were 61.10 ± 18.75 nmol/L (n = 190), with 68.4% of children defined as vitamin D sufficient (25(OH)D>50nmol/L). When stratified by winter months, only 58% of children were vitamin D sufficient. In single linear regression, plasma 25(OH)D concentrations were positively associated with dominant hand grip strength, single leg balance and the cognitive test '5choice movement time' ($p<0.05$). Overall, there was a reported mean score of 41.9% for parental vitamin D knowledge and 68% of parents thought there was no harm in giving their child vitamin D fortified foods.

Approximately 70% of this sample of children were vitamin D sufficient, however insufficiency was prevalent in almost half of the cohort during the winter months. Benefits of optimal vitamin D for muscle and cognitive function were evident. These results support the promotion of the existing vitamin D dietary recommendations during the winter months for optimal child growth and development.

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