

Vitamin D Status and Attention Deficit Hyperactivity Disorder: A Systematic Review and Meta-Analysis of Observational Studies.

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Adv Nutr. 2018 Jan 1;9(1):9-20.

doi: 10.1093/advances/nmx002.

Abstract

An association between vitamin D and attention deficit hyperactivity disorder (ADHD) has been proposed by several researchers in recent years; however, the investigations have led to inconsistent results. The present study was conducted to summarize the published observational data on the relation between vitamin D status and the likelihood of ADHD. Online databases, including PubMed, the ISI Web of Science, Google Scholar, and Scopus, were checked up to June 2017 for relevant observational studies. A random-effects model was incorporated to summarize the study results. Out of 2770 retrieved articles, 13 observational studies (9 case-control or cross-sectional studies and 4 prospective studies) were eligible for inclusion in the systematic review and meta-analysis. Analysis of the 10,334 children and adolescents who attended the 9 case-control or cross-sectional studies revealed that children with ADHD have lower serum concentrations of 25-hydroxyvitamin D than do healthy children (weighted mean difference: -6.75 ng/mL; 95% CI: -9.73, -3.77 ng/mL; I² = 94.9%). Five case-control studies reported the OR for developing ADHD based on vitamin D status; the meta-analysis of their data revealed that lower vitamin D status is significantly associated with the likelihood of ADHD (OR: 2.57; 95% CI: 1.09, 6.04; I² = 84.3%). Furthermore, the meta-analysis of prospective studies conducted in 4137 participants indicated that perinatal suboptimal vitamin D concentrations are significantly associated with a higher risk of ADHD in later life (RR: 1.40; 95% CI: 1.09, 1.81; I² = 0.0%). It should be noted that the association found in prospective studies was sensitive to one of the included investigations. The present review provides evidence supporting the relation between vitamin D deficiency and ADHD. However, the overall effect sizes are small, and therefore the association should be considered equivocal at this time. Further prospective cohort studies and community-based intervention trials are highly recommended to better elucidate the causal association.