Serum 25-hydroxyvitamin D concentration does not correlate with atopic dermatitis severity

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Background: An inverse correlation between serum 25-hydroxyvitamin D concentration and atopic dermatitis (AD) severity has been suggested.

Objective: To determine if a statistically significant relationship exists between serum 25-hydroxyvitamin D concentration and AD severity.

Methods: A cross-sectional study was conducted of patients with AD who were 1 to 18 years of age. An objective Severity Scoring of Atopic Dermatitis (SCORAD) and a serum 25-hydroxyvitamin D concentration were measured for each subject. Statistical analysis was performed using appropriate univariate tests and multivariable models.

Results: Ninety-four of 97 enrolled subjects were included in the analysis. Vitamin D deficiency (25-hydroxyvitamin D <20 ng/mL) was present in 37 subjects (39%), insufficiency (25-hydroxyvitamin D 21-29 ng/mL) in 33 (35%), and sufficiency (25-hydroxyvitamin D ≥ 30 ng/mL) in 24 (26%). The correlation between 25-hydroxyvitamin D concentration and SCORAD was not significant ($r = -0.001$; $P = .99$). A multivariate model showed that a lower serum 25-hydroxyvitamin D concentration was significantly associated with age 3 years or older ($P < .0001$), black race ($P < .0001$), and winter season ($P = .0084$).

Limitations: Limitations of this study include the inability to control for natural sunlight exposure, vitamin D intake, and AD treatment; in addition, only a single time point was captured.

Conclusions: Serum 25-hydroxyvitamin D concentration is not significantly correlated with AD severity in our pediatric population. (J Am Acad Dermatol 2013;69:40-6.)

Key words: asthma; atopic dermatitis; atopy; eczema; 25-hydroxyvitamin D; vitamin D.

INTRODUCTION

Vitamin D is a fat-soluble vitamin primarily made in the skin but also derived from dietary sources and supplements. Ultraviolet light exposure triggers the initial steps of synthesis of vitamin D. Subsequently, vitamin D is hydroxylated in the liver into 25-hydroxyvitamin D (25(OH)D), the major circulating

Abbreviations used:

1,25(OH)2D:	1,25-dihydroxyvitamin D
25(OH)D:	25-hydroxyvitamin D
AD:	atopic dermatitis
SCORAD:	Severity Scoring of Atopic Dermatitis

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Conflicts of interest: None declared.

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form, and serum concentrations of this metabolite are considered the primary indicator of vitamin D status. A second hydroxylation step in the kidney, as well as in other target tissues, generates the active metabolite 1,25-dihydroxyvitamin D (1,25(OH)2D). 1,25(OH)2D binds the vitamin D receptor and exerts its effects on cells by binding to vitamin D–responsive elements on DNA. In addition to regulation of calcium and phosphorus homeostasis, vitamin D plays a role in other physiologic processes and the vitamin D receptor is found on many target cells, including keratinocytes and almost all immune cells.[1]

Vitamin D plays a crucial role in normal cutaneous physiology and the immune response. It promotes cornified envelope formation and synthesis of the lipid permeability barrier.[2] Vitamin D also stimulates the production of human cathelicidin, an antimicrobial peptide that is deficient in atopic dermatitis (AD).[3,4] As the pathogenesis of AD involves a complex interplay of epidermal barrier dysfunction and dysregulated immune response, and vitamin D is involved in both processes, it is reasonable to expect that vitamin D status could be associated with AD risk or severity.

The results from prior studies offer conflicting information for practicing clinicians. Both increased and decreased vitamin D concentrations have been implicated as risk factors for the development of AD, while one study found an inverse correlation between serum 25(OH)D and AD severity.[5-7] Improvement of AD after oral supplementation with vitamin D has also been reported.[8-10] We sought to clarify the relationship between serum 25(OH)D and AD severity in our urban pediatric AD population.

CAPSULE SUMMARY

- Low serum vitamin D concentration has been associated with atopic dermatitis (AD) severity and risk.
- In a cross-sectional study of 94 children with AD, we found high rates of vitamin D deficiency but no correlation between serum vitamin D concentration and AD severity.
- Further studies are needed before vitamin D supplementation can be recommended as a treatment option for AD.

METHODS

Study population

Subjects were enrolled from the Children's Hospital of Wisconsin dermatology clinic in Milwaukee. Inclusion criteria included diagnosis of AD by a pediatric dermatologist and age 1 to 18 years old. Only children with a primary residence in Milwaukee County were enrolled in order to capture a high-risk urban population and minimize the confounding variable of increased sunlight exposure in rural children.[11] Exclusion criteria were as follows: chronic systemic disease other than asthma or environmental allergies, hyperimmunoglobulin E syndrome, ichthyosis disorder other than ichthyosis vulgaris, prior systemic therapy or phototherapy for AD, ongoing or prior treatment for known vitamin D deficiency, and chronic systemic corticosteroid therapy for asthma.

Study design

Institutional review board approval was obtained. Written informed consent was obtained from the parent or legal guardian, and subjects signed written assent when appropriate. AD disease severity was graded by the Severity Scoring of Atopic Dermatitis (SCORAD) index. The objective SCORAD has a range of 0 to 83 with an additional 20 points given for subjective symptoms of pruritus and sleep loss. An objective SCORAD score of <15 was classified as mild, 15-40 as moderate, and >40 as severe.[12] Patient variables of age, height, weight, race, Fitzpatrick skin type, and asthma diagnosis were documented. Subject enrollment was categorized by season: winter (January 1 to March 31), spring (April 1 to June 30), summer (July 1 to September 30), and fall (October 1 to December 31).

Serum concentration of 25(OH)D was obtained for each patient on the day of enrollment. The serum concentration of 25(OH)D was determined by using liquid chromatography tandem mass spectrometry (Quest Diagnostics Nichols Institute, San Juan Capistrano, CA). A serum 25(OH)D concentration was categorized as deficient if less than or equal to 20 ng/ml, insufficient if 21-29 ng/ml, and sufficient if equal to or greater than 30 ng/mL.[13] Subjects with deficient or insufficient serum 25(OH)D concentrations were treated with vitamin D supplementation as medically appropriate.

Statistical analysis

All statistical analyses were performed by means of SAS version 9.2 (SAS Institute, Cary, NC). Correlation between vitamin D and objective SCORAD was measured by Pearson correlation. The association of serum 25(OH)D concentration with categorical variables was assessed by one-way analysis of variance (ANOVA) and by nonparametric Wilcoxon rank sum test or Kruskal-Wallis test. A multiple linear regression model was used to