



EMORY
LIBRARIES &
INFORMATION
TECHNOLOGY

OpenEmory

Vitamin D Supplementation In Obese African American Children

[Vin Tangpricha](#), *Emory University*

Journal Title: Journal of Clinical and Translational Endocrinology

Volume: Volume 12

Publisher: Elsevier | 2018-06-01, Pages 48-49

Type of Work: Article | Final Publisher PDF

Publisher DOI: 10.1016/j.jcte.2018.04.003

Permanent URL: <https://pid.emory.edu/ark:/25593/sdrdj>

Final published version: <http://dx.doi.org/10.1016/j.jcte.2018.04.003>

Copyright information:

© 2018 The Author(s)

This is an Open Access work distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



Accessed November 14, 2019 9:57 AM EST



EDITORIAL

Vitamin D Supplementation In Obese African American Children



Vitamin D deficiency (serum 25(OH)D < 20 ng/mL) is present in 30-90% of overweight and obese children living in the United States, with higher rates among African-American children [1]. The prevalence of vitamin D deficiency has been consistently reported to be higher among African-Americans in part due to the decreased efficiency of cutaneous vitamin D production by darker skin [2]. Other factors contributing to lower vitamin D status among African-Americans include genetic differences in proteins involved in the vitamin D synthesis pathway and vitamin D binding protein [3]. The reasons why obesity is associated with vitamin D deficiency are unclear but likely related to increased volume of distribution of circulating 25(OH)D and/or fat sequestration of vitamin D [4,5].

Of concern has been the association between vitamin D deficiency and metabolic syndrome, adiposity markers, and insulin resistance in adults and children [6,7,8,9,10]. Several prospective trials have been conducted to investigate whether vitamin D supplementation in obese children can reverse some of these associations. The initial studies established that much higher doses of vitamin D are necessary in obese children to raise serum 25(OH)D to greater than 30 ng/mL [11]. Studies conducted in overweight African-American children and adults indicated that at least 2,000-4,000 IU of vitamin D was necessary to increase serum 25(OH)D > 30 ng/mL [12]. However, despite intakes of at least 2,000 IU daily of vitamin D, studies examining the impact of correction of vitamin D deficiency in obese children have demonstrated mixed results with some studies showing a beneficial response in insulin sensitivity [13,14] and some showing no changes in insulin sensitivity [15,16].

In this issue of JCTE, two clinical studies are presented examining the amount of vitamin D necessary to correct vitamin D deficiency in obese African-American adolescents and the impact on of vitamin D supplementation on markers of insulin resistance. Magge et al. [17] conducted a randomized, double-blinded, controlled trial in 26 obese African-American adolescents with vitamin D deficiency (25(OH)D < 20 ng/mL) between the ages of 12-17. Subjects received either 1,000 IU or 5,000 IU of vitamin D daily for 3 months. Unfortunately, only half of the subjects who received 5,000 IU of vitamin D daily achieved a serum 25(OH)D concentration greater than 30 ng/mL. The authors did not see any differences in the two vitamin D supplementation groups in markers of inflammation (hs-CRP) or insulin resistance including HOMA-IR and adiponectin. Sethuraman et al. [18] conducted a similar study randomizing 29 obese African-American children ages 13-17 with vitamin D deficiency (25(OH)D < 20 ng/mL) to either 50,000 IU of vitamin D2 once a week (~7000 IU daily) or placebo for 12 weeks. The mean serum 25(OH)D concentration was much higher in the vitamin D supplemented group compared to placebo

(32 ng/mL vs 12 ng/mL, $p < 0.0001$). Unfortunately, this study did not demonstrate any changes in HOMA-IR or insulin concentrations after intervention with vitamin D or placebo.

These two studies highlight the challenges surrounding vitamin D repletion in obese African-American children. In the study by Sethuraman et al, the amount of vitamin D (~7,000, a dose equivalent greater than 10 times the RDA for vitamin D in children) provided to obese African-American subjects increased serum 25(OH)D concentrations just slightly above 30 ng/mL. Still, up to a third of the subjects given vitamin D did not achieve a sufficient serum 25(OH)D concentration. Since this was a relatively short study of 12 weeks in duration, many subjects were likely still vitamin D insufficient during most of the study. A similar pattern of serum 25(OH)D was seen in the study by Magge et al where half of the subjects remained vitamin D insufficient on 5,000 IU of vitamin D daily. Both studies did not show any significant changes in markers of insulin resistance. These negative findings could be due to the inadequate dosing of vitamin D or a short follow-up period. Kelishadi et al found in 50 obese children randomized to vitamin D 300,000 IU delivered one to rapidly correct vitamin D status or placebo significant improvements in HOMA-IR and insulin concentrations in only the group receiving vitamin D [14]. Belenchia and colleagues studied obese adolescents randomized to 4,000 IU of vitamin D or placebo and observed significant changes in HOMA-IR after 6 months as well significant decreases in fasting insulin levels [13].

There remains a great deal of interest in studying the relationship between vitamin D status and insulin resistance in obese children and adults based on epidemiologic and observational studies. Randomized clinical trials to date have not been consistently able to demonstrate a benefit of vitamin D supplementation on markers of insulin resistance. Some of the challenges have included inadequate dosing of vitamin D to achieve serum 25(OH)D concentrations > 30 ng/mL and short duration of the trials. An important question is the timing of vitamin D intervention. Given the strong associations between vitamin D deficiency and disease, a better public health strategy may be to prevent vitamin D deficiency. Chronic vitamin D deficiency may be associated with changes in insulin resistance that may not be reversible in short term studies. Given the already known associations between vitamin D and calcium homeostasis and skeletal health, ensuring that obese children have more than adequate vitamin D status and improved lifestyle and nutrition throughout life seems to be a better approach to prevent insulin resistance and diabetes.

<https://doi.org/10.1016/j.jcte.2018.04.003>

References

- [1] Turer CB, Lin H, Flores G. Prevalence of vitamin D deficiency among overweight and obese US children. *Pediatrics*. 2013 Jan;131(1):e152–61.
- [2] Schleicher RL, Sternberg MR, Lacher DA, Sempos CT, Looker AC, Durazo-Arvizu RA, Yetley EA, Chaudhary-Webb M, Maw KL, Pfeiffer CM, Johnson CL. The vitamin D status of the US population from 1988 to 2010 using standardized serum concentrations of 25-hydroxyvitamin D shows recent modest increases. *Am J Clin Nutr*. 2016 Aug;104(2):454–61.
- [3] Hong J, Hatchell KE, Bradfield JP, Andrew B, Alessandra C, Chao-Qiang L, et al. Trans-ethnic Evaluation Identifies Novel Low Frequency Loci Associated with 25-Hydroxyvitamin D Concentrations. *J Clin Endocrinol Metab* 2018 Jan 9. <http://dx.doi.org/10.1210/jc.2017-01802>. [Epub ahead of print].
- [4] Drincic AT, Armas LA, Van Diest EE, Heaney RP. Volumetric dilution, rather than sequestration best explains the low vitamin D status of obesity. *Obesity (Silver Spring)* 2012 Jul;20(7):1444–8.
- [5] Pannu PK, Zhao Y, Soares MJ. Reductions in body weight and percent fat mass increase the vitamin D status of obese subjects: a systematic review and meta-regression analysis. *Nutr Res*. 2016 Mar;36(3):201–13.
- [6] Jackson JL, Judd SE, Panwar B, Howard VJ, Wadley VG, Jenny NS, Gutiérrez OM. Associations of 25-hydroxyvitamin D with markers of inflammation, insulin resistance and obesity in black and white community-dwelling adults. *J Clin Transl Endocrinol* 2016 Sep;5:21–5.
- [7] Rajakumar K, de las Heras J, Chen TC, Lee S, Holick MF, Arslanian SA. Vitamin D status, adiposity, and lipids in black American and Caucasian children. *J Clin Endocrinol Metab* 2011 May;96(5):1560–7.
- [8] Ashraf AP, Alvarez JA, Gower BA, Saenz KH, McCormick KL. Associations of serum 25-hydroxyvitamin D and components of the metabolic syndrome in obese adolescent females. *Obesity (Silver Spring)* 2011 Nov;19(11):2214–21.
- [9] Kelly A, Brooks LJ, Dougherty S, Carlow DC, Zemel BS. A cross-sectional study of vitamin D and insulin resistance in children. *Arch Dis Child* 2011 May;96(5):447–52.
- [10] Nunlee-Bland G, Gambhir K, Abrams C, Abdul M, Vahedi M, Odonkor W. Vitamin D deficiency and insulin resistance in obese African-American adolescents. *J Pediatr Endocrinol Metab* 2011;24(1-2):29–33.
- [11] Rajakumar K, Fernstrom JD, Holick MF, Janosky JE, Greenspan SL. Vitamin D status and response to Vitamin D(3) in obese vs. non-obese African American children. *Obesity (Silver Spring)* 2008 Jan;16(1):90–5.
- [12] Raed A, Bhagatwala J, Zhu H, Pollock NK, Parikh SJ, Huang Y, Havens R, Kotak I, Guo DH, Dong Y. Dose responses of vitamin D3 supplementation on arterial stiffness in overweight African Americans with vitamin D deficiency: A placebo controlled randomized trial. *PLoS One*. 2017 Dec 7;12(12):e0188424.
- [13] Belenchia AM, Tosh AK, Hillman LS, Peterson CA. Correcting vitamin D insufficiency improves insulin sensitivity in obese adolescents: a randomized controlled trial. *Am J Clin Nutr* 2013 Apr;97(4):774–81.
- [14] Kelishadi R, Salek S, Salek M, Hashemipour M, Movahedian M. Effects of vitamin D supplementation on insulin resistance and cardiometabolic risk factors in children with metabolic syndrome: a triple-masked controlled trial. *J Pediatr (Rio J)* 2014 Jan-Feb;90(1):28–34.
- [15] Nader NS, Aguirre Castaneda R, Wallace J, Singh R, Weaver A, Kumar S. Effect of vitamin D3 supplementation on serum 25(OH)D, lipids and markers of insulin resistance in obese adolescents: a prospective, randomized, placebo-controlled pilot trial. *Horm Res Paediatr* 2014;82(2):107–12.
- [16] Javed A, Vella A, Balagopal PB, Fischer PR, Weaver AL, Piccinini F, Dalla Man C, Cobelli C, Giesler PD, Laugen JM, Kumar S. Cholecalciferol supplementation does not influence β -cell function and insulin action in obese adolescents: a prospective double-blind randomized trial. *J Nutr* 2015 Feb;145(2):284–90.
- [17] Magge SN, Prasad D, Zemel BS, Kelly A. <https://doi.org/10.1016/j.jcte.2018.03.001>. *Journal of Clinical and Translational Research* June 2018.
- [18] Sethuraman U, Zidan MA, Hanks L, Bagheri M, Ashraf A. <https://doi.org/10.1016/j.jcte.2018.03.002>. *Journal of Clinical and Translational Research* June 2018.

Vin Tangpricha, MD, PhD

*Professor of Medicine Division of Endocrinology, Metabolism & Lipids
Department of Medicine, Emory University School of Medicine & Atlanta,
VA Medical Center, 101 Woodruff Circle NE-WRMB 1301, Atlanta, GA
E-mail address: vin.tangpricha@emory.edu*