Vitamin D Deficiency in the Afghan Refugee Population

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Abstract

Vitamin D is an important micronutrient for many processes in the body. Deficiency can range from asymptomatic to osteomalacia and rickets, which increase the probability of bone fractures. In countries where vitamin D rich or fortified foods are not easily accessible, deficiency has become a major healthcare crisis. Afghan refugees, especially women and children, have been found to have disproportionately high prevalence of vitamin D deficiency compared to other refugee populations. Cultural practices, socioeconomic status, and other environmental factors may play a large role in contributing to the high prevalence. As supplementation and screening protocols are not standardized for this population, all the contextual factors must be taken into consideration when assessing vitamin D status.

Introduction

Vitamin D is a fat-soluble nutrient that is essential for many processes in the body including maintaining bone health by absorbing calcium and phosphate. Laboratory studies have also shown that vitamin D can reduce cancer cell growth, help fight against infections and limit inflammation.[1] For most people, the main intake of vitamin D is through fatty fish such as salmon or fortified foods such as milk and orange juice. The recommended dietary allowance for vitamin D is 400 IU (10 mcg) for children up to 12 months, 600 IU (15 mcg) from 1 to 70 years and 800 IU (20 mcg) for those over 70 years.[1] Unfortunately, worldwide, deficiency is very common and it is estimated that up to 1 billion people worldwide have inadequate levels.

Vitamin D sufficiency is estimated through measuring calcidiol levels in the blood. Though the optimal serum concentration remains controversial, the National Academy of Medicine recommends levels to be above 20 ng/mL for adequate bone health maintenance.[2] This in turn defines vitamin D deficiency as calcidiol levels less than 12 ng/mL.[2] However, there is debate in the literature about the appropriate serum values and thus researchers often use different values to define vitamin D deficiency and sufficiency.

There are several causes of vitamin D deficiency including inadequate intake or absorption, reduced sun exposure to activate the pro-Vit D, increased hepatic catabolism, decreased endogenous synthesis such as through decreased enzyme activity in the liver and kidney, or end organ resistance to vitamin D.[3] Vitamin D deficiency can manifest in multiple pathological conditions with the worst being osteomalacia in adults and rickets in children. Most patients have moderate to mild deficiency (15 -20 ng/mL) and remain largely asymptomatic, with generally normal levels of phosphorus, calcium and alkaline phosphatase.[3] However, as the deficiency progresses to levels as low as 10 ng/mL, changes in parathyroid hormone (PTH) can be seen.[3] Patients with prolonged low vitamin D and elevated PTH levels (secondary hyperparathyroidism) are at risk for bone demineralization and phosphaturia, which can manifest as bone pain and tenderness, muscle weakness, fracture, or difficulty walking.[3]

Populations who are at high risk for developing vitamin D deficiency include the elderly, who may have decreased intake or limited sun exposure, those who live either at elevated latitude or have increased skin pigmentation, or those with medical comorbidities that lead to malabsorption or increased metabolism of vitamin D.[4] In children, infants who are exclusively breastfed may also be at risk.[1] Overall, the prevalence of vitamin D deficiency is generally correlated with differences in skin pigmentation. A national survey (NHANES III) indicated that Black non-Hispanic adolescents had 20 times the risk of having calcidiol levels < 20 ng/ mL compared to white non-Hispanic adolescents.[4]

A specific population that has been noted to be particularly at high risk includes the Afghan refugee population, especially women and children. Since 1998 with the opening of the International Rescue Committee, Charlottesville has welcomed over 4,600 refugees from 32 countries as new members to the community.[5] As political unrest increases in the Middle East, the clinic has seen an increasing number of refugees, those with Special Immigrant Visas, and parolees arrive from Afghanistan. Many of these individuals have come to receive care at the International Family Clinic at UVA, though their first encounter with US healthcare may be from various US government services including Department of State, US Centers for Disease Control and Prevention and the US Immigrant, Refugee and Migrant Health Branch. Literature has shown that refugees struggle at all points of healthcare access due to language barriers, stress, and trauma that they may have experienced in their journey. As we assist this population in adjusting to life in the US, we must also understand how their culture and background directly influence their health.

Vitamin D Deficiency in Afghan Refugees

A cross sectional analysis conducted in 2016 at French Medical Institute for Mothers and Children (FMIC) in Kabul found that 77.3% (238/308) of adolescents between the ages of 10-18 had insufficiency, deficiency or severe deficiency of vitamin D.[6] A national nutritional survey in Afghanistan in 2013 also found similarly high percentages of deficiency (95.5%) and severe deficiency (64.7%) in women aged 15-49 years old.[7] Though they live in relatively sunny climates, there are likely several different factors that contribute to this high prevalence of vitamin D deficiency in this population, including insufficient intake, low socioeconomic status and cultural practices such as wearing covered clothing or limited sun exposure.

Malnutrition

The refugee population is a vulnerable population that may undergo a number of traumatic events during their journey from their home country. As a result, many are at high risk for nutritional and health disparities. Malnutrition is common in refugee camps primarily due to food insecurity, poor socio-economic conditions, inadequate food intake and disease burden.[8] Numerous studies in refugee populations have reported a wide variance of vitamin D deficiency from 13% to 98%, with Middle Eastern and East African groups with the highest prevalence.[8] A cross sectional study of 206 adolescent (ages 10-19 years) Afghan boys and girls in a refugee camp in Pakistan showed a significantly high prevalence of micronutrient deficiencies including 80.5% of the adolescents having vitamin D deficiency.[9] Even in those who have arrived to the United States or Canada, longer duration of residence in camps prior to resettlement was associated with greater severity of deficiency.[8] The daily diet of this

population has also been linked to the cause of vitamin D deficiency in this population. In a study by Grant et al, level of consumption of foods such as animal fat, eggs, ocean fish, meat, and milk were relatively lower in countries of the Middle East as reported by the Food and Agriculture Organization of the United Nations[10], though further research is necessary for more accurate depictions of the amount consumed on a daily basis. Furthermore, fortification and supplementation of vitamin D are not regular practices in these countries.

Cultural Practices

Another major contributor to the hypovitaminosis pandemic in the Afghan population may be related to cultural practices of wearing head coverings and scarves. This has largely been theorized due to the significantly higher prevalence of the deficiency being seen in the Afghan females compared to males. Many studies looking at vitamin D deficiency found statistically significant associations between gender and serum calcidiol (25(OH)D) levels.[6–8] A cross sectional study reported that almost all the women in reproductive age screened in Afghanistan were deficient in vitamin D.[7] One study in particular showed that sunlight exposure was one of the dominant factors of vitamin D status in Afghan adolescents living in Kabul, with a correlation in duration of sunlight exposure and exposed skin area with vitamin D levels.[6] This has led to theories that the possible causes of severe vitamin D deficiency among female adolescents may be due to reduced sun exposure from wearing religious clothing or from increased time spent indoors either due to cultural practices or political instability. This is also supported by a study done in Turkey, where calcidiol levels were measured among girls 13 to 17 years old who were stratified into 3 groups. Group I included girls living in a suburban area, Group II girls lived in an urban area, and Group III girls lived in an urban area and wore concealing clothes for religious reasons similarly to many Afghan women. They found that those in group III (wearing covered dress), the serum 25(OH)D concentrations were statistically significantly lower than in the other 2 groups, and within this group, 50% of girls were vitamin D deficient. Interestingly, the vitamin D levels of these girls did not improve in the summer, whereas those in groups I and II did.[11] Though increased skin pigmentation may also account for the high prevalence of hypovitaminosis D in the Afghan population, the fact that refugees interned in Congo, Djibouti and Cuba did not show similar severity of deficiency indicate that cultural and dietary practices may play a significant role in causation and could potentially be areas for intervention for this population.[8]

Supplementation

Currently, there is no global guidance on the assessment of vitamin D status by the World Health Organization (WHO) apart from advising against empirical supplementation during pregnancy for prevention of perinatal complications such as preeclampsia. However, the WHO recommends supplementation of 200 IU per day for pregnant women with suspected Vitamin D deficiency and the American College of Obstetrics and Gynecology recommends supplementation with 1000-2000 IU per day when vitamin D deficiency is identified.[12–14] There is also very limited information on the appropriateness of vitamin D screening and supplementation in the Afghan refugee population. Refugees arriving in the United States are provided with a free healthcare screening upon arrival that includes various exams, bloodwork, and vaccinations. Guidelines for the appropriate tests and

workup are delineated in the *Summary Checklist for Domestic Medical Examination for Newly Arriving Refugees* provided by the CDC. However, this does not contain any recommendations for testing for vitamin D deficiency or any guidelines for supplementation.[15] Interestingly, CDC's *Guidelines for Evaluation of the Nutritional Status and Growth in Refugee Children During the Domestic Medical Screening Examination* does indicate the high prevalence of vitamin D deficiency in refugee populations, especially those with limited sun exposure from traditional clothing or socioeconomic climates that lead to increased time indoors.[16]

Because of this, the burden falls on the individual physicians to determine appropriate screening and supplementation for vitamin D deficiency in this population. The American Academy of Pediatrics has a *C* SORT evidence rating recommendation for children and adolescents consuming less than 1 L of vitamin D–fortified milk per day to receive 400 IU of supplemental vitamin D daily with a greater amount being required for those at higher risk.[17] A systematic review and meta-analysis in 2019 that aimed to look at optimal vitamin D supplementation dosing in various populations found that there was an obvious dose-response effect between intake amount and serum calcitriol levels, but this relationship varied based on geographic region and baseline levels.[18] According to this study, to reach sufficient 25(OH)D concentration (75 nmol/L), the recommended vitamin D supplemental intake was 1229 IU/day for adults in the Middle East.[18] However, according to the evidence summary by Lefevre and Lefevre, serum 25(OH)D concentrations of 30 to 50 nmol/L is sufficient to maintain bone health and routine vitamin D supplementation or screening is not recommended for the general population.[19] Furthermore, a review by Yao et al. emphasized that the current evidence does not support the supplementation of vitamin D alone and favors the combination with calcium supplementation for the prevention of fractures,[20] although the United States Preventative Services Task Force recommends against vitamin D supplementation to prevent falls in community-dwelling older adults.[21] There are also downsides to continuous calcium and vitamin D supplementation that must be weighed. The Women's Health Initiative trial found a statistically significant increase in the incidence of kidney stones in women taking vitamin D and calcium compared to women taking placebo.[22]

Outside of vitamin D supplementation, behavioral recommendations may help to increase serum vitamin D levels. As little as 10 to 15 minutes of direct sunlight can generate 10,000 to 20,000 IU of vitamin D, though those with darker skin pigmentation require five to 10 times the length of sunlight exposure to reach the same levels of 25-hydroxyvitamin D.[19]

Conclusion

Vitamin D deficiency is a major health concern among the refugee population, especially women and children from Afghanistan. Currently, they are only screened and treated if the physician deems it necessary (for example, is aware of who may be at high risk) or the patient presents with symptoms that may point towards deficiency. Supplementation is also not standardized, as these practices are not recommended even for the general US population based on lack of evidence for beneficial outcomes. Further research needs to be conducted on the appropriate treatment of vitamin D deficiency in refugees in the US including amount and duration of supplementation, the interplay between cultural practices and ongoing deficiency,

and whether environmental change alone is sufficient to correct asymptomatic vitamin D deficiencies. Healthcare providers need to continue to encourage maximizing skin production of vitamin D by encouraging children to play outdoors for upwards of 30 minutes a day, educating families on increasing intake of vitamin D fortified foods, and prescribing supplementation if necessary to prevent lasting consequences of vitamin D deficiency.

References

1. Office of Dietary Supplements - Vitamin D. Accessed October 2, 2022. https://ods.od.nih.gov/factsheets/VitaminD-Consumer/

2. *Read "Dietary Reference Intakes for Calcium and Vitamin D" at NAP.Edu*. doi:10.17226/13050

3. Valcour A, Blocki F, Hawkins DM, Rao SD. Effects of age and serum 25-OH-vitamin D on serum parathyroid hormone levels. *J Clin Endocrinol Metab*. 2012;97(11):3989-3995. doi:10.1210/jc.2012-2276

4. Saintonge S, Bang H, Gerber LM. Implications of a new definition of vitamin D deficiency in a multiracial us adolescent population: the National Health and Nutrition Examination Survey III. *Pediatrics*. 2009;123(3):797-803. doi:10.1542/peds.2008-1195

5. Charlottesville, VA | The IRC. Accessed October 3, 2022. https://www.rescue.org/united-states/charlottesville-va

6. Azizi S. Prevalence of and factors associated with vitamin D deficiency among Afghan adolescents diagnosed at a tertiary healthcare facility in Kabul, Afghanistan. *Theses Diss*. Published online January 1, 2017. https://ecommons.aku.edu/theses_dissertations/765

7. Elrayah EE, Rogers L, Doggui R, Al-Jawaldeh A. Vitamin D insufficiency and deficiency in the Eastern Mediterranean Region (EMR)—misconceptions in public health practice: A scoping review 2019-2020. *J Nutr Sci Vitaminol (Tokyo)*. 2020;66(5):389-395. doi:10.3177/jnsv.66.389

8. Smith E. Vitamin deficiencies among resettled refugees in Buffalo, NY. *J Refug Glob Health*. 2019;2(2). doi:10.18297/rgh/vol2/iss2/1

9. Saeedullah A, Khan MS, Andrews SC, et al. Nutritional status of adolescent Afghan refugees living in Peshawar, Pakistan. *Nutrients*. 2021;13(9):3072. doi:10.3390/nu13093072

10. Grant WB, Fakhoury HMA, Karras SN, Al Anouti F, Bhattoa HP. Variations in 25-Hydroxyvitamin D in countries from the Middle East and Europe: the roles of UVB exposure and diet. *Nutrients*. 2019;11(9):E2065. doi:10.3390/nu11092065

11. Hatun S, Islam Ö, Cizmecioglu F, et al. Subclinical vitamin D Deficiency is increased in adolescent girls who wear concealing clothing. *J Nutr*. 2005;135(2):218-222. doi:10.1093/jn/135.2.218

12. World Health Organization. *WHO Antenatal Care Recommendations for a Positive Pregnancy Experience: Nutritional Interventions Update: Vitamin D Supplements during Pregnancy*. World Health Organization;

2020. Accessed October 4, 2022. https://apps.who.int/iris/handle/10665/333562

13. WHO recommendation regarding Vitamin D supplementation during pregnancy. WHO - RHL. Accessed October 5, 2022. https://srhr.org/rhl/article/who-recommendation-regarding-vitamin-d-supplementation-during-pregnancy-3

14. Vitamin D: screening and supplementation during pregnancy. Accessed October 9, 2022. https://www.acog.org/en/clinical/clinical-guidance/committee-opinion/articles/2011/07/vitamin-d-screening-and-supplementation-during-pregnancy

15. Guidance for the U.S. Domestic medical examination for newly arriving refugees | Immigrant and Refugee Health | CDC. Published March 26, 2021. Accessed October 2, 2022. https://www.cdc.gov/immigrantrefugeehealth/guidelines/domestic-guidelines.html

16. Guidelines for evaluation of the nutritional status and growth in refugee children during the domestic medical screening examination. Accessed October 2, 2022. https://stacks.cdc.gov/view/cdc/44594

17. Casey CF, Slawson DC, Neal LR. Vitamin D supplementation in infants, children, and adolescents. *Am Fam Physician*. 2010;81(6):745-748.

18. Mo M, Wang S, Chen Z, et al. A systematic review and meta-analysis of the response of serum 25-hydroxyvitamin D concentration to vitamin D supplementation from RCTs from around the globe. *Eur J Clin Nutr*. 2019;73(6):816-834. doi:10.1038/s41430-019-0417-x

19. LeFevre ML, LeFevre NM. Vitamin D screening and supplementation in community-dwelling adults: common questions and answers. 2018;97(4):7.

20. Yao P, Bennett D, Mafham M, et al. Vitamin D and calcium for the prevention of fracture: A systematic review and meta-analysis. *JAMA Netw Open*. 2019;2(12):e1917789. doi:10.1001/jamanetworkopen.2019.17789

21. Interventions to prevent falls in community-dwelling older adults: US Preventive Services Task Force Recommendation Statement | Geriatrics | JAMA | JAMA Network. Accessed October 3, 2022. https://jamanetwork.com/journals/jama/fullarticle/2678104

22. Calcium plus vitamin D supplementation and the risk of fractures | NEJM. Accessed October 3, 2022. https://www.nejm.org/doi/full/10.1056/nejmoa055218