

Mini Review

Can we Depend on Sunshine for Vitamin D? A Mini Review and Historical Perspective

Archisha Marya¹, Kirti Mohan Marya^{2*} and Ramesh Kumar Marya³

¹School of Medicine, University of Liverpool, Liverpool, United Kingdom

²Department of Orthopaedics, Aster DM Healthcare, Dubai, United Arab Emirates

³Department of Physiology, Quest International University, Ipoh, Malaysia

Abstract

Worldwide studies have confirmed that vast population globally is suffering from vitamin D deficiency that can be linked to not only calcium and bone metabolic disorders, but also to diabetes, hypertension, rheumatoid arthritis and multiple sclerosis. Traditionally, inadequate sunlight exposure was implicated in Vitamin D deficiency. However recent studies from the Middle East and other countries suggest the contrary and thus unreliable. Test based diagnostics remain the most desirable way to prevent and treat Vitamin D deficiency rather than relying on sunshine.

Keywords: Sunshine; Vitamin D deficiency; Vitamin D supplementation

In 1650, Francis Glisson, a Cambridge physician, published in Latin a treatise on rickets titled “De Rachitide.” Glisson’s work remains a classic among medical texts. Glisson’s report on rickets was based on clinical and postmortem experience. Glisson’s treatise addresses the clinical features of rickets in a scientific tone. Glisson was convinced that rickets was neither contagious nor heritable. His conclusions regarding the relationship of age to onset of rickets has stood the test of times [1].

In late 1890, a Scottish physician Dr Palm, made remarkable observations on the incidence of rickets and its geographical

***Corresponding author:** Marya KM, Department of Orthopaedics, Aster DM Healthcare, Dubai, United Arab Emirates, Email: drkmmarya@yahoo.com

Citation: Marya A, Marya KM, Marya RK (2021) Can we Depend on Sunshine for Vitamin D? A Mini Review and Historical Perspective. J Orthop Res Physiother 7: 053.

Received: March 31, 2021; **Accepted:** April 09, 2021; **Published:** April 16, 2021

Copyright: © 2021 Marya A, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

distribution. He spent 10 years in Japan, where he noted that rickets was essentially absent. Back in England, he was intrigued by the very high prevalence of rickets. Rickets abounded in the UK in large towns and industrialized regions: Glasgow and Edinburgh and the coal-bearing regions of the country. Both cities were hazy and smoggy, and the air was filled with soot. It was also an area with the highest prevalence of rickets.

Palm was intrigued to note that children in tropical zones were exposed to filth, poor sanitation and unsafe water, yet they were free of rickets. Medical missionaries from China, Mongolia, India, Morocco and Ceylon did not encounter rickets. Palm came to the conclusion that “the geography of rickets appears to involve the temperate latitudes of Europe: Germany, England, Holland, Belgium, France and northern Italy but southern Italy, southern Spain, Turkey and Greece with greater sunshine “enjoy a notable immunity from it.” Exposure to plenty of sunshine, which was the norm for infants residing in the tropics, was responsible for their protection against rickets. In 1889, Palm recommended “systematic use of sun-baths as a preventive and therapeutic measure in rickets.” However, Palm’s observations and recommendations were ignored by the medical world [2].

In 1916, Harry Steenbock, a Professor of Biochemistry at the University of Wisconsin, USA while working on goats found that they were in positive calcium balance when kept in summer sun outdoors, but when kept indoors in the winter in the absence of sunlight, they went into negative calcium balance. Steenbock had then mentally made a connection between sunlight and calcium retention. With this background, Steenbock began to irradiate rats, and their food with UV light. He found that irradiation of not only the rat but also their food could prevent or cure rickets. This led to the industrial irradiation of milk to increase its antirachitic property [3].

In the light of all these reports, the knowledge of anthracitic property of sun shine led to disappearance of rickets and osteomalacia from most parts of the world, by the middle of 20th century. However, the existence of subclinical deficiency of vitamin D remained unknown till a method was developed for the estimation of 25(OH)D. Probably, the first reports of vitamin D insufficiency appeared from the UK. Three group of workers reported low levels of 25(OH) in pregnant Asian immigrants [4-6]. The authors attributed the vitamin D deficiency to inadequate solar exposure due to geographical location of the country, coupled with deficient dietary intake of the vitamin. Subsequently, a large number of reports demonstrated the existence of vitamin D-deficiency not only during pregnancy but also in non-pregnant females and even males. Reports of vitamin D deficiency in males and females appeared from tropical countries such as India [7,8], Pakistan [9], Bangladesh [10], UAE [11], and even Africa [12]. In these countries, sunshine is available almost throughout the year. Therefore, the role of various factors that determine the availability of UV radiation from solar exposure needs to be analysed.

It should be appreciated that all sunshine does not lead to cutaneous vitamin D synthesis. Only radiation energies between 290 and 320 nm are most effective [13]. Because of the complex mechanism of vitamin D₃ production in the epidermis, the amount of solar exposure required for providing vitamin D adequate for the body's requirements varies in different individuals and under different conditions. The photosynthesis of vitamin D₃ depends upon:

- i. The surface area of the skin exposed to sunlight
- ii. The time of the day of exposure (UV radiation is most intense between 11 AM and 2 PM)
- iii. The amount of melanin pigment present in the epidermis
- iv. Latitude (UV radiation is most intense at the equator)
- v. Season (in winter less UV radiation reaches the surface of the earth)
- vi. Environmental pollution such as smoke, fog and dust prevent UV radiation from reaching the earth [14].

Probably because of all these factors, unrealistically long exposure times seem to be required to obtain recommended vitamin D doses through skin [15].

Worldwide studies have confirmed that vast population of the world is suffering from vitamin D deficiency. Clinical implication of this fact lies in the reports that have implicated vitamin D deficiency not only in calcium and bone metabolic disorders, but also in type I diabetes [16,17] type II diabetes [18], hypertension [19] rheumatoid arthritis [20] and multiple sclerosis [21]. Furthermore, vitamin D is known to play a role in the human antimicrobial response [22].

Conclusion

The solar exposure incidental to the day-to-day activities of most of the populations seems to be inadequate for their vitamin D requirement, and therefore hypovitaminosis D is a global problem. A controlled multi-centric trial might provide necessary insight for knowing what dose provides vitamin D sufficiency, without raising 25(OH)D₃ to toxic levels. Currently, the most desirable way to prevent and treat Vitamin D deficiency related symptoms would thus remain blood test-based diagnostics and then appropriate supplementation rather than relying on sunshine.

References

1. Dunn PM (1998) Francis Glisson (1597–1677) and the “discovery” of rickets. *Arch Dis Child Fetal Neonatal Ed* 78: F154-F155
2. Chesney RW (2012) Theobald Palm and his remarkable observation: How the sunshine vitamin came to be recognized. *Nutrients* 4: 42-51.
3. DeLuca HF (2014) History of the discovery of vitamin D and its active metabolites. *Bonekey Rep* 3: 479-485.
4. Heckmatt JZ, Peacock M, Davies AE, McMurray J, Isherwood DM (1979) Plasma 25-hydroxyvitamin D in pregnant Asian women and their babies. *Lancet* 2: 546-549.
5. Cockburn F, Belton NR, Purvis RJ, Brown JK, Turner TL, et al. (1980) Maternal vitamin D intake and mineral metabolism in mothers and their newborn infants. *Br Med J* 281: 11-14.
6. Brooke OG, Brown IR, Bone CD, Carter ND, Cleeve HJ, et al. (1980) Vitamin D supplements in pregnant Asian women: effect on calcium status and fetal growth. *Br Med J* 280: 751-754.
7. Goswami R, Gupta N, Goswami D, Marwaha RK, Tandon N, et al. (2000) Prevalence and significance of low 25-hydroxyvitamin D concentrations in healthy subjects in Delhi. *Am J Clin Nutr* 72: 472-475.
8. Aparna P, Muthathal S, Nongkynrih B, Gupta SK (2018) Vitamin D deficiency in India. *J Family Med Prim Care* 7: 324-330
9. Riaz H, Finlayson AE, Bashir S, Hussain S, Mahmood S, et al. (2016) Prevalence of vitamin D deficiency in Pakistan and implications for the future. *Expert Rev Clin Pharmacol* 9: 329-338.
10. Islam AK, Hasan M, Rahman K, Md Asaduzzaman, Rahim MA, et al. (2019) Vitamin D status in Bangladeshi subjects: a laboratory based study. *BIRDEM Med J* 9: 202-206.
11. Nimri LF (2018) Vitamin D status of female UAE college students and associated risk factors. *J Public Health (Oxf)* 40: e284-e290.
12. Mogire RM, Mutua A, Kimita W, Kamau A, Bejon P, et al. (2019) Prevalence of vitamin D deficiency in Africa: a systematic review and meta-analysis. *Lancet Glob Health* 8: E134-E142.
13. MacLaughlin JA, Anderson RR, Holoick MR (1982) Special character of sunlight modulates the photosynthesis of provitamin D₃ and its photoisomers in human skin. *Science* 216:1001-1003.
14. Holick MF, MacLaughlin JA, Doppelt SH (1981) Factors that influence the cutaneous photosynthesis of previtamin D₃. *Science* 211: 590-593.
15. Engelsen O (2010) The Relationship between Ultraviolet Radiation Exposure and Vitamin D Status. *Nutrients* 2: 482-495
16. Chiu KC, Chu A, Go VLW, Saad MF (2004) Hypovitaminosis D is associated with insulin resistance and beta cell dysfunction. *Am J Clin Nutr* 79: 820-825.
17. Luong K, Nguyen LT, Nguyen DN (2005) The role of vitamin D in protecting type 1 diabetes mellitus. *Diabetes Metab Res Rev* 21: 338-346.
18. Pittas AG, Lau J, Hu FB, et al. (2007) The role of vitamin D and calcium in type 2 diabetes: a systematic review and meta-analysis. *J Clin Endo Metab* 92: 2017-2029.
19. Krause R, Buhning M, Hopfenmuller W, Holick MF, Sharma AM (1998) Ultraviolet B and blood pressure. *Lancet* 352: 709-710.
20. Kostoglou-Athanassiou F, Athanassiou P, Lyraki A, Raftakis L, Antoniadis C (2012) Vitamin D and rheumatoid arthritis. *Ther Adv Endocrinol Metab* 3: 181-187.
21. Munger KL, Zhang SM, O'Reilly E, Hernan MA, Olek MJ, et al. (2004) Vitamin D intake and incidence of multiple sclerosis. *Neurology* 62: 60-65.
22. Youssef SA, Miller CWT, El-Abbassi AM, Cutchins DC, Cutchins C, et al. (2011) Antimicrobial implications of vitamin D. *Dermatoendocrinol* 3: 220-229.



- Advances In Industrial Biotechnology | ISSN: 2639-5665
- Advances In Microbiology Research | ISSN: 2689-694X
- Archives Of Surgery And Surgical Education | ISSN: 2689-3126
- Archives Of Urology
- Archives Of Zoological Studies | ISSN: 2640-7779
- Current Trends Medical And Biological Engineering
- International Journal Of Case Reports And Therapeutic Studies | ISSN: 2689-310X
- Journal Of Addiction & Addictive Disorders | ISSN: 2578-7276
- Journal Of Agronomy & Agricultural Science | ISSN: 2689-8292
- Journal Of AIDS Clinical Research & STDs | ISSN: 2572-7370
- Journal Of Alcoholism Drug Abuse & Substance Dependence | ISSN: 2572-9594
- Journal Of Allergy Disorders & Therapy | ISSN: 2470-749X
- Journal Of Alternative Complementary & Integrative Medicine | ISSN: 2470-7562
- Journal Of Alzheimers & Neurodegenerative Diseases | ISSN: 2572-9608
- Journal Of Anesthesia & Clinical Care | ISSN: 2378-8879
- Journal Of Angiology & Vascular Surgery | ISSN: 2572-7397
- Journal Of Animal Research & Veterinary Science | ISSN: 2639-3751
- Journal Of Aquaculture & Fisheries | ISSN: 2576-5523
- Journal Of Atmospheric & Earth Sciences | ISSN: 2689-8780
- Journal Of Biotech Research & Biochemistry
- Journal Of Brain & Neuroscience Research
- Journal Of Cancer Biology & Treatment | ISSN: 2470-7546
- Journal Of Cardiology Study & Research | ISSN: 2640-768X
- Journal Of Cell Biology & Cell Metabolism | ISSN: 2381-1943
- Journal Of Clinical Dermatology & Therapy | ISSN: 2378-8771
- Journal Of Clinical Immunology & Immunotherapy | ISSN: 2378-8844
- Journal Of Clinical Studies & Medical Case Reports | ISSN: 2378-8801
- Journal Of Community Medicine & Public Health Care | ISSN: 2381-1978
- Journal Of Cytology & Tissue Biology | ISSN: 2378-9107
- Journal Of Dairy Research & Technology | ISSN: 2688-9315
- Journal Of Dentistry Oral Health & Cosmesis | ISSN: 2473-6783
- Journal Of Diabetes & Metabolic Disorders | ISSN: 2381-201X
- Journal Of Emergency Medicine Trauma & Surgical Care | ISSN: 2378-8798
- Journal Of Environmental Science Current Research | ISSN: 2643-5020
- Journal Of Food Science & Nutrition | ISSN: 2470-1076
- Journal Of Forensic Legal & Investigative Sciences | ISSN: 2473-733X
- Journal Of Gastroenterology & Hepatology Research | ISSN: 2574-2566
- Journal Of Genetics & Genomic Sciences | ISSN: 2574-2485
- Journal Of Gerontology & Geriatric Medicine | ISSN: 2381-8662
- Journal Of Hematology Blood Transfusion & Disorders | ISSN: 2572-2999
- Journal Of Hospice & Palliative Medical Care
- Journal Of Human Endocrinology | ISSN: 2572-9640
- Journal Of Infectious & Non Infectious Diseases | ISSN: 2381-8654
- Journal Of Internal Medicine & Primary Healthcare | ISSN: 2574-2493
- Journal Of Light & Laser Current Trends
- Journal Of Medicine Study & Research | ISSN: 2639-5657
- Journal Of Modern Chemical Sciences
- Journal Of Nanotechnology Nanomedicine & Nanobiotechnology | ISSN: 2381-2044
- Journal Of Neonatology & Clinical Pediatrics | ISSN: 2378-878X
- Journal Of Nephrology & Renal Therapy | ISSN: 2473-7313
- Journal Of Non Invasive Vascular Investigation | ISSN: 2572-7400
- Journal Of Nuclear Medicine Radiology & Radiation Therapy | ISSN: 2572-7419
- Journal Of Obesity & Weight Loss | ISSN: 2473-7372
- Journal Of Ophthalmology & Clinical Research | ISSN: 2378-8887
- Journal Of Orthopedic Research & Physiotherapy | ISSN: 2381-2052
- Journal Of Otolaryngology Head & Neck Surgery | ISSN: 2573-010X
- Journal Of Pathology Clinical & Medical Research
- Journal Of Pharmacology Pharmaceutics & Pharmacovigilance | ISSN: 2639-5649
- Journal Of Physical Medicine Rehabilitation & Disabilities | ISSN: 2381-8670
- Journal Of Plant Science Current Research | ISSN: 2639-3743
- Journal Of Practical & Professional Nursing | ISSN: 2639-5681
- Journal Of Protein Research & Bioinformatics
- Journal Of Psychiatry Depression & Anxiety | ISSN: 2573-0150
- Journal Of Pulmonary Medicine & Respiratory Research | ISSN: 2573-0177
- Journal Of Reproductive Medicine Gynaecology & Obstetrics | ISSN: 2574-2574
- Journal Of Stem Cells Research Development & Therapy | ISSN: 2381-2060
- Journal Of Surgery Current Trends & Innovations | ISSN: 2578-7284
- Journal Of Toxicology Current Research | ISSN: 2639-3735
- Journal Of Translational Science And Research
- Journal Of Vaccines Research & Vaccination | ISSN: 2573-0193
- Journal Of Virology & Antivirals
- Sports Medicine And Injury Care Journal | ISSN: 2689-8829
- Trends In Anatomy & Physiology | ISSN: 2640-7752

Submit Your Manuscript: <https://www.heraldopenaccess.us/submit-manuscript>