

Vitamin D deficiency in healthcare professionals across the network of an eye care organization in India

Dear Editor,

Vitamin-D, an essential fat-soluble vitamin, regulates several bodily functions. Mostly, it is produced in the skin when sunlight exposure is adequate. Factors that influence vitamin-D levels are age, gender, sunlight exposure or outdoor activities, skin pigmentation, belly fat, climatological seasons and intake from natural sources or supplements.^[1] Because of modern trends such as air-conditioned indoor work-life (e.g., digitized professional areas), it is likely that the risk of vitamin-D deficiency may have drastically increased. There is a high prevalence of vitamin-D deficiency in healthcare sector and there is a lack of literature on eye care workforce. Our purpose is to evaluate vitamin-D in healthcare professionals across the network of an eye care organization in India.

All employees ($n = 2374$), working across three levels of eye care (a center of excellence, 3 tertiary centers and 18 secondary centers) each in the Indian states of Andhra Pradesh, Karnataka, Odisha and Telangana, were included. None was using any form of vitamin-D supplementation. As part of annual staff health check-up, blood samples were collected during July-August 2019 and analyzed for 25-hydroxy vitamin-D levels by chemiluminescent immunoassay. Vitamin-D <30 ng/ml was considered deficient or insufficient. Statistical analysis was performed using STATA v14.2 (StataCorp, College Station, USA). Descriptive measures included mean \pm standard error and proportion. Data were categorized into vitamin-D deficient and normal groups; age and gender were compared by mixed-effects model with random intercepts at levels of eye care and state. Relationships between age and gender with vitamin-D was evaluated by multilevel mixed-effects linear regression. A P value of <0.05 was considered statistically significant.

Mean age of employees was 29.3 ± 0.7 years. A total of 1164 (49%) were males and 1210 (51%) females. Mean vitamin-D was 20.14 ± 1.08 ng/ml. A total of 2185 employees (92%) had vitamin-D below normal range [Table 1]. Mean age in normal group (33.7 years) was significantly ($P < 0.0001$) higher than deficient group (29 years). Proportion of males was significantly ($P = 0.04$) lower in deficient group (49%) than normal group (55%). There was a significant ($P < 0.001$) positive correlation between age and vitamin-D in deficient group [Fig. 1], but not in normal group ($P = 0.35$). Males had significantly ($P < 0.001$) higher vitamin-D than females in deficient group [Fig. 2] and not in normal group ($P = 0.59$). Multiple regression analysis showed that both age ($P < 0.001$; coefficient = 0.09 ± 0.01) and gender ($P < 0.001$; coefficient = 2.51 ± 0.22) were significantly associated with vitamin-D in deficient group (constant = 14.61 ± 0.97).

Ninety-two percent were found to be vitamin-D deficient in our cohort. Previous studies showed high prevalence of deficiency in healthcare sector.^[2-6] A study of 2119 Indian healthcare professionals covering 18 cities found only 6% were vitamin-D sufficient.^[2] A study among 340 hospital staff in Qatar showed that 97% were deficient.^[3] Vitamin-D deficiency in eye care professionals could be due to long working hours and most of the time is spent inside patient examination rooms

Table 1: Vitamin D in eye care professionals

	Vitamin D deficient	Vitamin D normal
Age (years), mean \pm SE	29.0 \pm 0.7	33.7 \pm 2.5
Male:Female (ratio)	1060:1125 (0.94:1)	104:85 (1.22:1)
Vitamin D levels		
N	2185	189
Mean \pm SE	18.37 \pm 0.87	39.38 \pm 1.85
Minimum	4.20	30.00
Maximum	29.79	114.53
Vitamin D levels (males)		
N	1060	104
Mean \pm SE	19.99 \pm 0.93	39.44 \pm 1.69
Minimum	4.56	30.00
Maximum	29.66	114.53
Vitamin D levels (females)		
N	1125	85
Mean \pm SE	16.83 \pm 0.89	38.88 \pm 2.30
Minimum	4.20	30.07
Maximum	29.79	112.12

This table summarizes age, gender and Vitamin D in the employees of a tertiary eye care center with Vitamin D deficient and Vitamin D normal levels (N: number; SE: standard error)

or operation theatres which are completely indoor. Particularly, diagnostic eye tests require dark-room illumination and the workers are deprived of sunlight. We conducted investigations in monsoon season when sunlight exposure is minimal that can contribute to a higher prevalence of deficiency.^[7,8]

Older aged tend to have lesser vitamin-D levels as they may have decreased production in skin and reduced dietary intake and absorption.^[6] However, we found a significant positive correlation between age and vitamin-D in deficient group. Hagenau *et al.* found that children had less vitamin-D than adults and individuals aged >75 years have fewer levels than individuals between 65-75 years.^[9] Mean level in 65-75 years was 22.83 ng/ml that is comparable to 20.01 ng/ml in our study.

Further, we evaluated the effect of age and gender separately in deficient and normal groups. Males have significantly higher levels than females in young Iraqi and Jordanians,^[10] whereas women have borderline, but significantly, higher levels in a meta-regression analysis.^[9] A study in Indian healthcare professionals showed that men and women have no significant difference in levels.^[2] Interestingly, we did not find any effect of age and gender in normal group.

The strength of our study is that all samples were analysed in a single laboratory in the same season across all grades of employees. As only age and gender were explored in this study which was a limitation, other factors like amount of sunlight exposure, body mass index, outdoor activity, race, seasonal variation and skin pigmentation need to be considered in future research.

This cross-sectional study revealed that vitamin-D deficiency was common in eye care sector as a result of the nature of work environment. It may be overlooked unless an evaluation is performed as part of annual health check-up. It is recommended to incorporate this in routine medical evaluation. Most importantly, as India is a tropical country with naturally abundant sunshine, the deficiency of this essential vitamin can

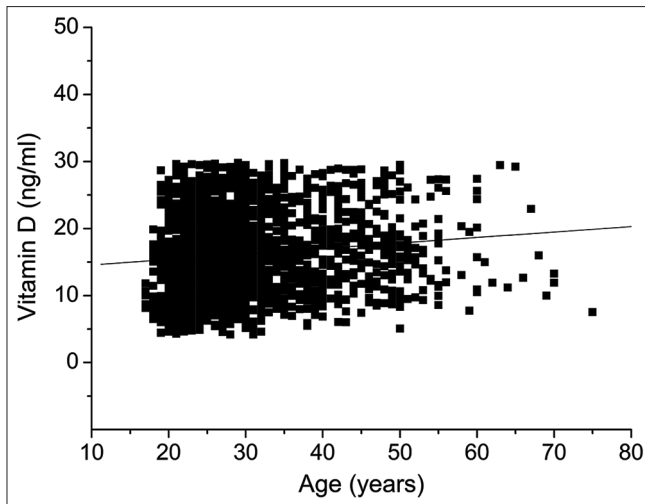


Figure 1: Age vs Vitamin D in Vitamin D deficiency: This scatter plot shows the relationship between age and Vitamin D levels in the Vitamin D deficient group

be easily prevented by emphasizing outdoor sunlight exposure. Periodic evaluations and awareness would help in promoting overall health and well-being in working professionals.

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Conflicts of interest

There are no conflicts of interest.

**Sushma Nandyala[#], Ashik Mohamed[#],
Archana Bhargava¹, Sunita Chaurasia²,
Sirisha Senthil³, Pravin K Vaddavalli²**

Ophthalmic Biophysics, ¹Internal Medicine, ²The Cornea Institute and ³VST Centre for Glaucoma Care, L V Prasad Eye Institute, Hyderabad, Telangana, India

[#]Authors with equal contributions

Correspondence to: Dr. Ashik Mohamed,
Ophthalmic Biophysics, L V Prasad Eye Institute, L V Prasad
Marg, Banjara Hills, Hyderabad - 500 034, Telangana, India.
E-mail: ashikmohamed@lvpei.org

References

- Moyad MA. Vitamin D: A rapid review. *Dermatol Nurs* 2009;21:1.
- Beloyartseva M, Mithal A, Kaur P, Kalra S, Baruah MP, Mukhopadhyay S, *et al.* Widespread vitamin D deficiency among Indian health care professionals. *Arch Osteoporos* 2012;7:187-92.
- Mahdy S, Al-Emadi SA, Khanjar IA, Hammoudeh MM, Sarakbi HA, Siam AM, *et al.* Vitamin D status in health care professionals in Qatar. *Saudi Med J* 2010;31:74-7.
- LeBlanc E, Chou R, Zakher B, Daeges M, Pappas M. Screening for Vitamin D deficiency: Systematic review for the U.S. Preventive Services Task Force recommendation. *Ann Intern Med* 2015;162:109-21.
- Lim JS, Kim KM, Rhee Y, Lim SK. Gender-dependent skeletal effects of vitamin D deficiency in a younger generation. *J Clin Endocrinol Metab* 2012;97:1995-2004.

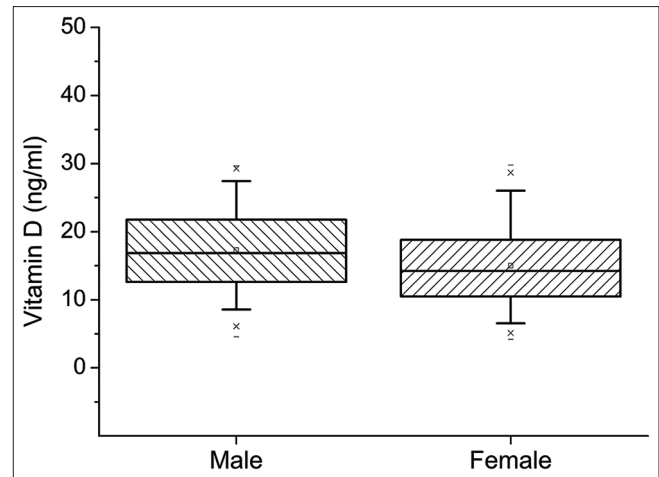


Figure 2: Vitamin D levels by gender in Vitamin D deficiency: This box-whisker plot shows the Vitamin D levels in males and females in the Vitamin D deficient group

- Arya V, Bhambri R, Godbole MM, Mithal A. Vitamin D status and its relationship with bone mineral density in healthy Asian Indians. *Osteoporos Int* 2004;15:56-61.
- Tangpricha V, Pearce NE, Chen TC, Holick MF. Vitamin D Insufficiency among free-living healthy young adults. *Am J Med* 2002;112:659-62.
- Malhotra N, Mithal A, Gupta S, Shukla M, Godbole M. Effect of vitamin D supplementation on bone health parameters of healthy young Indian women. *Arch Osteoporos* 2009;4:47-53.
- Hagenau T, Vest R, Gissel TN, Erlandsen M, Mosekilde L, Vestergaard P. Global vitamin D levels in relation to age, gender, skin pigmentation and latitude: An ecologic meta-regression analysis. *Osteoporos Int* 2009;20:133-40.
- Al-Horani H, Dayyih WA, Mallah E, Hamad M, Mima M, Awad R, *et al.* Nationality, gender, age, and body mass index influences on vitamin D concentration among elderly patients and young Iraqi and Jordanian in Jordan. *Biochem Res Int* 2016;2:1-8.

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