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. 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 ± 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.[3,4] A study of 2119 Indian healthcare professionals covering 18 cities found only 6% were vitamin-D sufficient.[5] A study among 340 hospital staff in Qatar showed that 97% were deficient.[6] 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 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.[9] 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.[10] 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,[11] whereas women have borderline, but significantly, higher levels in a meta-regression analysis.[12] A study in Indian healthcare professionals showed that men and women have no significant difference in levels.[13] 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

| Table 1: Vitamin D in eye care professionals |
|----------------------------------------------|
| Age (years), mean±SE                               | Vitamin D deficient | Vitamin D normal |
| Male:Female (ratio)                                | 1060:1125 (0.94:1)  | 104:85 (1.22:1)  |
| Vitamin D levels                                   |                        |                  |
| N                                               | 2185                    | 189              |
| Mean±SE                                          | 18.37±0.87              | 39.38±1.85       |
| Minimum                                          | 4.20                     | 30.00            |
| Maximum                                          | 29.79                    | 114.53           |
| Vitamin D levels (males)                          |                        |                  |
| N                                               | 1060                    | 104              |
| Mean±SE                                          | 19.99±0.93              | 39.44±1.69       |
| Minimum                                          | 4.56                     | 30.00            |
| Maximum                                          | 29.66                    | 114.53           |
| Vitamin D levels (females)                        |                        |                  |
| N                                               | 1125                    | 85               |
| Mean±SE                                          | 16.83±0.89              | 38.88±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)
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.

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