Letter - In Press – Medical Journal of Australia
Words = 495
Figures = 1
References = 5

Vitamin D insufficiency in south-east Queensland

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Studies from Perth[1], Hobart[2], central Victoria [3], and Adelaide [4] have recently drawn attention to the surprisingly high rates of vitamin D insufficiency and deficiency in Australia (often defined as = 50nmol/L and = 38nmol/L 25 hydroxyvitamin D_3 respectively). There has been a lack of data from subtropical regions such as Queensland, where there is more intense ultraviolet radiation. Our group has an interest in vitamin D[5], and had the opportunity to examine vitamin D levels in a case-control study designed to examine risk factors for psychosis.

Within an area of south-east Queensland (latitude 27^0 south), we randomly sampled individuals with psychosis from a wide range of sites. A well control group was drawn from the same catchment area. Ultraviolet radiation levels were measured using a permanently mounted outdoor erythemal UV meter and sunshine duration was measured with a Campbell-Stokes recorder. Serum 25 hydroxyvitamin D_3 levels were measured with a commercially available radio-immunoassay (DiaSorin Inc). All subjects gave written, informed consent, and the study was approved by the local Institutional Ethics Committee.

The sample consisted of 222 males and 192 females. The mean age was 42.0 years (SD 13.2). 113 subjects lived in "rural areas" as defined by the Australian Bureau of Statistics. Overall the mean (and standard deviation; range) for 25 hydroxyvitamin D_3 in this sample was 69.1 nmol/L (26.2; 12.2-174.5). 23.4% of the sample had levels equal or less than 50 nmol/L, and 8% of the sample had levels equal or less than 38 nmol/L. There was no significant group difference in vitamin D levels between the subjects with psychosis and the well controls ($t=0.026$, $df=412$, $p = 0.98$). Males had significantly higher 25 hydroxyvitamin D_3 levels compared to females (mean, SD; 72.0, 25.8: 65.9, 26.4 nmol/L respectively: $t=2.36$, $df=412$, $p=0.02$). Those living in rural areas had significantly higher 25 hydroxyvitamin D_3 levels compared to those living in urban areas (mean, SD: 74.0, 31.6; 68.1, 23.5 nmol/L respectively: $t = 2.00$, $df=371$, $p = 0.04$).

There was no significant correlation between age and 25 hydroxyvitamin D_3 level (Pearson r= -0.06, p=0.25). There were statistically significant positive correlations between 25 hydroxyvitamin D_3 and both sunshine (r=0.10, p=0.04) and ultraviolet radiation (r=0.24, p=0.001). When examined by quartiles of sunshine duration (1^{st} quartile being the shortest and 4^{th} quartile being the longest duration of sunshine), the mean (SD) 25 hydroxyvitamin D_3 levels for the 1^{st}, 2^{nd}, 3^{rd} and 4^{th} quartiles were not strictly linear - 64.3 (24.9), 66.1 (23.1), 76.3 (24.8) and 67.0 (31.5) respectively.

The within-month variation shown in the Figure was least for July, which also had the lowest mean 25 hydroxyvitamin D_3 levels. We speculate that behaviour during this time of year was modified (less outdoor activity, less skin exposures etc) and/or the weaker ultraviolet radiation during this month was less efficient in producing vitamin D. Living in a subtropical climate does not guarantee adequate vitamin D and supplementation with vitamin D may be more widely needed than previously thought in Queensland.

References

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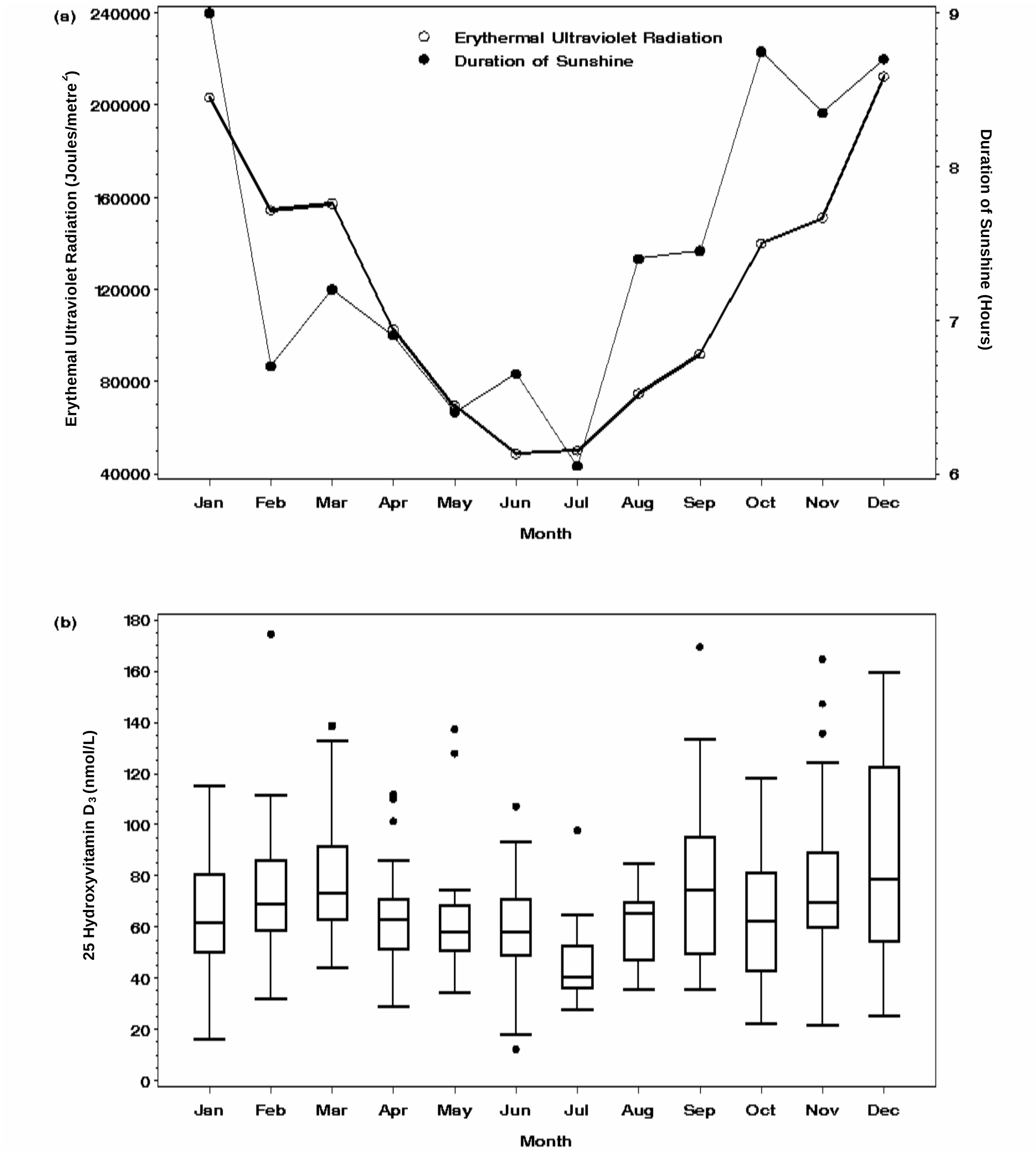

Figure 1

(a) Upper panel. Mean monthly erythemal ultraviolet radiation (joules per square metre) and mean monthly duration of sunshine (hours).

(b) Lower panel. Boxplot of 25 hydroxyvitamin D levels per month (nmol/L). The centre line in the box is the mean, while the upper and low borders of the box define the 25th and 75th percentile. The whiskers indicate minimum and maximum values excluding outliers, asterisks indicate outliers.