Reviewer's report

Title: Vitamin D levels and deficiency with different occupations: a systematic review

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Reviewer: Mark Farrar

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This manuscript presents a systematic review exploring the impact of occupation on vitamin D status. Although not specifically stated, it presents a meta-analysis of pooled data in an attempt to identify occupations at risk of low vitamin D status. While the aim of the review has merit, there are some methodological issues that undermine the findings.

GENERAL COMMENTS

1. Although the authors state that "...vitamin D and 25-(OH)D were used interchangeably", this is best avoided so as not to cause confusion. "Levels" should be used in relation to 25-(OH)D only whereas "status", "deficiency" and "insufficiency" should be used in the context of vitamin D.

2. Further to point (1), there is some discrepancy regarding the authors definitions of deficiency/insufficiency (this relates also to the methods on Page 11). It is true that there is no international consensus on the 25-(OH)D levels defining deficiency/insufficiency etc. However, the authors' interpretation of the IOM report (for the US and Canada) is incorrect. The IOM recommends a population target of 50 nmol/L 25-(OH)D for vitamin D sufficiency. It's remit was not to define a level for deficiency but they suggest <30 nmol/L represents risk of deficiency and between 30 and 50 nmol/L represents risk of insufficiency. In light of this, use of vitamin D status terms needs reviewing throughout the manuscript.

3. The language is a little clumsy in places with some statements not making sense (e.g. background points 2 & 3 below). Please carefully proof-read for accuracy and clarity.
SPECIFIC COMMENTS

Background

1. Page 4: The first sentence refers to the US population only but reference 2 relates to Canada. It should also be noted that the data in reference 1 is >10 years old but is presented as if current.

2. P4, para 1: Vitamin D is not "implicated" in Ca homeostasis and bone health, its role is firmly established.

3. P4, para 2: It is not proven that endogenous vitamin D synthesis accounts for 90% of total acquisition, this is an estimate/assumption.

4. P4, para 2: It is important to note that 1,25-(OH)2D can be synthesised extra-renally, including in skin.

Methods and Results

The literature search criteria, and thus data included, are too broad to provide meaningful outcomes. Some studies are 30-40 years old. Changes in lifestyle, working habits/patterns and sun exposure behaviour have changed significantly, not to mention improvement in 25-(OH)D assay methods. Furthermore, and perhaps more importantly, skin colour and ethnicity is not taken into account in the analyses. This has a major impact on vitamin D status in terms of ability to synthesise vitamin D and sun exposure/protection behaviour which will undoubtedly confound the results. Lack of robust seasonal data is also an issue. Such confounders are mentioned in the discussion but are not addressed in the analyses. Overall, this systematic review would benefit from narrower search criteria in terms of publication year and target population in order to provide meaningful results and enable directed advice/recommendations.

Statistical Analyses: The use of multiple t-tests, even with correction, is not an advisable approach and does not allow for meaningful interpretation. The aim of a meta-analysis such as this should be to determine whether occupation (essentially as a proxy for sunlight exposure)
impacts on vitamin D status through relative risk analysis. This will show which occupations are of greater/lesser risk relative to the entire cohort.

It would be advisable to re-analyse the data using more robust methods and re-write the discussion around the findings. At present, the discussion is very unfocussed and seems to comment on individual studies/groups of studies rather than the findings of the review.

References: Please proof read for consistency of presentation (e.g. journal abbreviations).

Figures: There are too many graphs. Latitude plots are unnecessary and too crowded to easily see the data. Re-analysis of data will guide the figures required. Refer to other meta-analyses for examples.

Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.

No

Does the work include the necessary controls?
If not, please specify which controls are required in your comments to the authors.

Unable to assess

Are the conclusions drawn adequately supported by the data shown?
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No

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