Reviewer’s report

Title: Association between poor oral health and diabetes among Indian adult population: Potential for integration with NCDs.

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Reviewer: Bethy Turton

Reviewer’s report:

Thank you for the chance to review this interesting article that examines the patterns of periodontal disease and dental caries as associated with diabetes. The sampling and data were very strong and there is a good chance that this paper could make a valuable contribution to the literature especially if they can strengthen the narrative by proactively highlighting the key ideas in their narrative.

There are three ideas that seem to be in this paper; that the association between perio and diabetes has not been investigated very extensively or with very high quality data sets among low and middle income countries; that oral diseases should be measured during any NCD survey; that given the high prevalence of oral diseases there should be access to care to help manage them (universal access to care). It is not clear which of these points are the key point that the author wishes to convey and that could be compromising the readability of the paper. I would ask that the authors choose one key point and the subordinate the other points to create a stronger narrative.

If the authors would like to make the integration of oral disease measurement and management with NCD the main point then I would like to make the following suggestions for authors to consider:

- Consider making an opening statement about the high prevalence of oral disease when compared to other health conditions that are commonly measured. How does it compare to hypertension etc. This could lead on to justification of why diabetes was shown as a key NCD to demonstrate the point that is being made

- It is also important to use data-points from the literature that are comparable to the methodology in the present study. In line 38 the authors give the figure of 7% as being the proportion of those with severe chronic periodontitis but in this study the authors only measure mild periodontitis and so using an altered disease definition in the analysis or in the introduction would help to create continuity in the narrative

- It is important to comment on the suffering created by oral diseases not just in terms of the cost to treat but also in terms of the reduced quality of life [line 48]
could emphasize the significance of this survey in cross-profession advocacy and cooperation and that survey's such as this are important for recognizing oral disease among the NCD paradigm and the need for pathways to universal health care access that includes management of oral disease.

It is interesting that oral mucosal lesions were described here and that is great; however, it is hard to see how this fits with the narrative of the paper as those lesions are not included in later modelling. There should be more justification as to why these data were included.

If the authors want to make a stronger point about diabetes and periodontal disease then I suggest adding more material around describing the epidemiology and clinical presentation of periodontitis and diabetes both in a south Asian region and globally.

Need a little more of the narrative around the comorbidity of caries and NCD. In contrast need to point out the biological plausibility of the pathway between Perio and Diabetes. These points can be used to build a stronger case for the common risk factor approach.

Other methodological issues are

1. Definition of periodontal disease - The definition of loss of attachment is not clear, how was this measured? Which anatomical landmarks were taken into account? What type of probing system? It seems that LOA was defined as >1mm and if I understand this correctly then there are a number of problems with that definition of disease as it relates to the association to periodontal disease. Firstly, a patient can have loss of attachment without gingivitis and be stable in which case the inflammatory pathway and the relationship to periodontal disease would be quite different. Secondly, it could be considered quite normal for older adults to have 1mm or more of loss of attachment and it may be worth considering an age adjusted definition of periodontal disease. Finally, and perhaps most importantly, it is acknowledged that measurements can be very unreliable and so differences of up to 2mm between measurements might actually be considered as reliable as you might hope to achieve. Therefore, I suggest adjusting the definition of LOA to be loss of attachment >2mm (that is 5mm from the CEJ) in order to ensure that you are identifying the real perio cases. In the key reference that the authors use to inform their methodology (Page and Eke et al., 2007) then that would meet the 'moderate periodontitis' category which would have a higher chance of being accurate than using the 'mild periodontitis' category (>3mm CAL) as the diagnostic variable. I suspect this would make your risk modelling a little stronger as well.

2. CPI Score should not be reported as a mean score. It is a categorical definition which does not have equal increments of disease with each increment in numerical category. That is to say the difference between CPITN code 1 and CPITN code 2 is not equal to the difference between CPITN code 2 and CPITN code 3. It is more helpful to present data as the proportion of participants in each category or the authors might choose to use data on the proportion of participants who are CPITN 3 or more.
3. Multivariate modelling - it is not clear about what covariates are entered into the models? Line 141 the authors state that the poison model predicts the severity of condition for those who had scores of >0. Does this mean the severity of the diabetes condition or the severity of oral disease? Please clarify this within the methods section.

4. Regarding the caries indicator, it is important to recognize caries as a cumulative measure of disease which means that hose in the older age-group are likely to have a higher dmft. Therefore the authors could consider age adjusting or using the significant caries index for each age-group and I would expect that this would aid in creating a more reliable model.

5. In the conclusion the authors make a point about access to care, however, that was not part of the aim of the paper. Suggest limiting the statement to the stated aims and the importance of recognizing oral disease as a comorbidy to NCD and a driven by common risk factors to other NCD. Alternatively, consider making the narrative about both NCD and universal health care and that would make the present conclusion more relevant. This will depend on how the authors choose to strengthen the narrative

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

Yes

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

Yes

Are the conclusions drawn adequately supported by the data shown?
If not, please explain in your comments to the authors.

Yes

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If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

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