**Reviewer’s report**

**Title:** Factors Associated with Type 2 Diabetes in Patients with Vascular Dementia: A Population-Based Cross-Sectional Study

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**Reviewer:** Ronan O’Caoimh

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Factors associate with Type 2 Diabetes in Patients with Dementia: A population-based cross sectional study

This paper examines differences in characteristics (demographic characteristics and co-morbidities) between diabetics and non-diabetics in Taiwanese adults with incident dementia (i.e. factors associated with incident dementia in the year to new diagnosis examining those with and without diabetes), showing that those with diabetes were more likely to be young, female and have multiple co-morbidities compared to non-diabetics with incident dementia.

**Background:**

A brief, targeted introduction. More discussion around what risk factors are associated with dementia in diabetes should be included. A few grammatical errors are also evident - P5 line 16-17 "in order TO identify...lines 22-23 and "linked WITH cognitive decline...."

**Methods:**

While it is likely that all the sample are incident cases, time of onset may be less certain given the challenges of diagnosis. Within the confines this is a limitation of the study.

The ICD-9 code for 'Senile dementia, uncomplicated' should be elaborated. As a term this usually refers to only Alzheimer's (AD). Could other codes such as incident vascular or other dementia subtypes also be included in analysis? The association between vascular dementia (VaD) is stronger and it would be important to consider this. The paper should either be about AD only or VAD only or mixed or all dementia subtypes. This should be clarified. The title/text refer to dementia but this is a multi-faceted and multi-factorial heterogeneous condition, which should be clearly stipulated. The difficulty with diagnostic classification and rate of misclassification should be included as a limitation and the title changed if AD was the only
dementia that was sought. My guess is that the authors meant all dementia or at least AD/VaD or mixed but not e.g. Lewy Body or Frontotemporal etc. Hence, the ICD codes included should be narrowed/widened and clarified for clinically minded readers.

Is this referring to Type 1 or 2 DM or both? - there are likely to be significant differences between these in terms of duration/co-morbidity etc. If only type 2 this should be included in the title/text for clarity. If both, I suggest doing a sensitivity analysis examining both separately and including the tables as appendices.

Is it possible to determine when DM was diagnosed?

On P7, the authors refer to disease severity (line 23-24) - is this referring to diabetes or dementia or something else? Please clarify.

The categories of co-morbidities should be expanded - I suggest separating cerebrovascular disease/stroke/tia from cardiovascular/PVD disease and renal disease from hypercholesterolaemia.

Results and discussion:

While the results are well presented, other analysis should be performed to improve the paper. Further analysis/sensitivity analysis should be performed in light of the diagnostic classification mentioned above.

The discussion also needs to be improved to, to discuss the finding in context of other relevant papers. Please consider the following:

Are other pertinent risk factors such as alcohol or smoking history available? This could explain differences in liver disease or cancers.

It is known that diabetics develop dementia at an earlier age; likewise many of these co-morbidities are expected to be more common in diabetics. The data presented here is similar to that found in other studies e.g. in a study in Western Australia by Zilkens et al., 2013 found that the mean time to incident dementia was 2.2 years younger in diabetics, which is very similar to this study. The discussion should refer to other papers in this area and compare and contrast these findings - hence, while this is reassuring and reinforces what is known (and powered by a large sample), it is not novel.

Instead, it would be more interesting to look at the degree (strength of association) to which diabetes is independently associated with incident diabetes. Can the authors add this comparison? - it would really enhance the novelty and interest of this paper. Adjusting for all the other factors associated with dementia i.e. age, gender, vascular co-morbidities, renal disease to what degree is DM independently associated with the development of dementia. I appreciate that collinearity is a challenge but it should be explored.

Also, is there any data on rate of progression i.e. is the stage of dementia known, recorded and followed in this data set? If so, what factors are associated with progression to end-stage etc. in diabetics compared to non-diabetics? Similarly can this dataset be used to examine if diabetes is associated with greater healthcare use or mortality in those with incident dementia? Surely, in such a dataset, some of these data are also available.

More discussion on what the significance/relevance of what individual associated factors mean is required for e.g. what is the significance of higher peptic ulcer disease - could this be a false association or a reflection of a general higher burden of medications/co-morbidities etc.

Limitations as above should be included as above including the risk of effects of collinearity on the associations.

**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.

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