

Impaired Sensitivity to Thyroid Hormones is Associated with Mild Cognitive Impairment in Euthyroid Patients with Type 2 Diabetes [Response to Letter]

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Dear editor

We appreciate Sun et al for their interest and comments about our recent paper¹ in *Clinical Interventions in Ageing* regarding a relationship between thyroid hormone sensitivity and mild cognitive impairment (MCI) in euthyroid patients with type 2 diabetes (T2D). In terms of the exclusion criteria, Sun et al raised four points to be clarified or discussed, and we appreciate the opportunity to provide supplementary insights.

The first point concerns the lack of vitamin D data. We agree that vitamin D levels are generally low in the Chinese population with T2D and that reduced vitamin D concentrations may be associated with cognitive impairment. However, recent large-scale population studies have yielded conflicting results, indicating that vitamin D status may not be significantly associated with cognitive function.^{2,3} Given the existing contradictions in the current findings, it may be premature to definitively conclude that vitamin D plays a pivotal role in cognitive function. Furthermore, we observed that the previously published literature on cognitive impairment related to T2D^{4,5} or the association between thyroid function and cognitive function^{6,7} did not exclude individuals with vitamin D deficiency. Therefore, it is plausible that vitamin D deficiency may not be an obligatory exclusion criterion.

The second point is about the lack of data on bone mineral density (BMD) and bone turn over markers (BTMS). While we acknowledge the potential link between bone loss, osteoporosis, and cognitive impairment, it is noteworthy that there exists no consensus within the literature on this subject.⁸ Moreover, it appears that bone loss and osteoporosis are not established as recognized exclusion criteria in studies of cognitive impairment related to T2D^{4,5} or in studies examining the association between thyroid function and cognitive function.^{6,7}

The third point pertains to the lack of nutrition status data. We concur that major diseases, such as poor nutritional status, cancer, and severe liver or renal dysfunction, are closely related to cognitive impairment. Consequently, we excluded patients with these aforementioned conditions.

The fourth point regards the lack of estimated glomerular filtration rate (eGFR) data. First, as mentioned above, we have excluded patients with severe renal dysfunction. Secondly, it is regrettable that we did not collect eGFR data; however, we did obtain creatinine, which is another crucial indicator for assessing renal function. Our findings showed no significant difference in creatinine between the normal cognitive function group and the MCI group.

In conclusion, as confirmed by our study,¹ impaired sensitivity to thyroid hormones is associated with MCI in euthyroid patients with T2D. We actively recommend thyroid function examination for the early identification of MCI in

patients with T2D. It's crucial to emphasize that the focus on thyroid function should not solely revolve around single hormone alterations but should also encompass a consideration of thyroid hormone sensitivity.

Disclosure

The authors report no conflicts of interest in this communication.

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