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Is Vitamin D a Panacea for the Octogenarian with Type 2 Diabetes?

Advances in medicine have led to an increase in the life expectancy of elderly patients with diabetes, especially of the growing population called the "oldest old," those octogenarians in their mid-80s upwards. Considering the significant increase in the overall elderly population of more than 761 million worldwide, we can surmise the impact of diabetes and its complications.

Depression, mild cognitive impairment (MCI), and dementia are frequently encountered co-morbidities in clinical practice. These impose significant social, medical, and economic burdens, especially in the geriatric population with type 2 diabetes (T2D). A plethora of evidence suggests that T2D not only leads to vascular dementia but also to Alzheimer's disease-type dementia. Oldest adults with diabetes have a high risk of undiagnosed cognitive dysfunction, depression, and functional incapacities. Cognitive impairment in this population is associated with poor diabetes control [1].

Excellent tools like the Montreal Cognitive Assessment (MoCA) for MCI, the Geriatric Depression Scale (GDS-30), and the Hospital Anxiety and Depression Scale (HADS) are available to assess the psychiatric profile of senior citizens with T2D.

The predictors of MCI in octogenarians with T2D include a bias towards the female gender, low HDL cholesterol, increased HADS anxiety score, fasting blood glucose (FBG,) and longer duration of diabetes [2]. According to these researchers, 76% of the 400 patients included in their study had depression of varying degrees, while 56.8% of studied patients had MCI. Decreased levels of HDL-cholesterol and increased HADS anxiety scores were significant predictors of depression.

Chakraborty et al. [3], while assessing cognitive function in different age groups of persons with T2D, reported a prevalence of MCI in T2D patients in the age group 81–90 years of 75% using the MoCA, and a Digit Symbol Substitution Test (DSTT) score of 18.8% for cognitive functions.

Vitamin D is an essential micronutrient called "the sunshine vitamin." Although generally referred to as a vitamin, it is a hormone due to its steroid structure and mechanism of action. Vitamin D deficiency is yet another rampant health problem posing multiple wellness hazards to this vulnerable age group. Vitamin D deficiency can lead to skeletal consequences like reduced bone mineral density, osteomalacia, frailty, and fractures. Specific extra-skeletal effects include added risks for falls, reduced muscle strength, diabetes, cancer, and cardiovascular disease. Vitamin D deficiency contributes to both the initial insulin resistance and the subsequent onset of diabetes, facilitated by a dwindling functional β-cell mass. Vitamin D supplementation mitigates inflammation — a contributing factor for insulin resistance.

Vitamin D supplementation may avert the onset of dementia by several neuroprotective mechanisms that include increased phagocytosis of amyloid-beta peptide, regulation of neurotrophins (a family of proteins that help neurons survive, develop, and function) and calcium homeostasis, anti-inflammatory, and antioxidant [4]. The insufficiency or deficiency of vitamin D may lead to decreased memory and MCI.

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Vitamin D receptors exist in the human cortex and hippocampus, which are crucial areas for cognitive functioning, and an absence or malfunction of these receptors has been implicated in the occurrence of neurodegenerative dementia such as Alzheimer's disease. Vitamin D deficiency is widespread in super elderly patients with Alzheimer's disease, with an incidence of 70% to 90% [5].

There is a clear association between vitamin D deficiency and severe retinopathy, diabetic peripheral neuropathy, and poor cognitive performance in the oldest persons with T2D. At the same time, there is agreement about the beneficial effect of vitamin D supplementation on peripheral artery disease, foot ulceration prevention, and wound healing. However, the beneficial effects of vitamin D supplementation on major cardiovascular adverse events, endothelial dysfunction, and diabetic kidney disease remain controversial. Despite the inconsistent results of many randomized control trials of vitamin D in the aged, most support the idea that vitamin D supplementation improves metabolic parameters (lipids, insulin resistance, glucose) and reduces the complications of T2D in elderly patients [6].

It is very important that we determine the appropriate vitamin D dose to be administered to the elderly person with diabetes. While low dosages may be ineffective, large doses of vitamin D may have harmful consequences by disrupting intracellular calcium signaling.

Conflict of interest

The author declares no conflict of interest.

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