Title: Can Vitamin D Supplementation Improve Poor Cognition in People with Type 2 Diabetes?

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Session Title: Vitamin D and Its Impact Across the Lifespan
Slot: F 12: Friday, 28 July 2017: 2:30 PM-3:45 PM
Scheduled Time: 2:30 PM

Keywords: Cognition, Type 2 diabetes and Vitamin D

References:


Abstract Summary: This oral presentation will be part of a symposium that discusses the impact of vitamin D on symptoms reported by individuals across the lifespan. This specific presentation will discuss an ongoing randomized control trial that is investigating if vitamin D supplementation will improve cognition in people with type 2 diabetes.
Learning Activity:

<table>
<thead>
<tr>
<th>LEARNING OBJECTIVES</th>
<th>EXPANDED CONTENT OUTLINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The learner will be able to describe the impact of low vitamin D on cognition in people with type 2 diabetes.</td>
<td>Evidence for low vitamin D levels on cognition in people with type 2 diabetes will be presented.</td>
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<tr>
<td>The learner will be able to describe the impact of poor cognition on diabetes self-care activities.</td>
<td>Evidence regarding the impact of poor cognition in management of diabetes will be presented.</td>
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</tbody>
</table>

Abstract Text:

Purpose:

One in nine people aged 65 and older has Alzheimer’s disease which is a chronic debilitating disease with no known cure (Alzheimer’s Association, 2014). Vitamin D deficiency has been found to be related to increased risk of dementia, Alzheimer’s and executive dysfunction (cognitive processes including working memory, reasoning, task flexibility, and problem solving). A meta-analysis of 14 observational studies, three prospective cohort studies, and three intervention studies has demonstrated that lower concentrations of vitamin D was associated with executive dysfunction (especially processing speed, mental shifting, and information updating) and that repletion was associated with improved executive functioning (Annweiler et al., 2013). More recently, participants from the United States Cardiovascular Health Study (n=1658 adults) who were followed prospectively for six years and were found to have a doubled the risk for dementia and Alzheimer’s if they were vitamin D deficient at baseline (Littlejohns et al., 2014). Persons with diabetes have been reported to have a higher incidence of vitamin D deficiency (Penckofer, Kouba, Wallis, & Emanuele, 2008).

Diabetes is the seventh leading cause of death in the United States. In 2012, there were 1.7 million new cases of diabetes diagnosed and the total costs of diagnosed diabetes in 2012 was $245 billion (American Diabetes Association, nd). Of concern is that diabetes is associated with cognitive impairment (Tuligenga et al., 2014; Wennberg et al., 2014). A large cohort study reported that for people with known diabetes there was a 45% faster decline in memory, a 29% faster decline in reasoning, and a 24% faster decline in cognition compared to those with no diabetes (Tuligenga et al., 2014). Also, self-reported diabetes was associated with immediate and delayed word recall and poorer memory (Wennberg et al., 2014). Cognitive impairment makes glycemic control challenging because self-management activities are cognitively demanding. Executive function comprises cognitive skills needed for the execution of complex activities which can include self-monitoring and daily management of diabetes. Also, executive dysfunction has been found to be associated with poor glycemic control.

A randomized control trial study of vitamin D supplementation for treatment of cognitive impairment in persons with diabetes has not been done to our knowledge, and the reason this current study is being conducted. The primary aim of the ongoing study is to determine the effect of vitamin D₃ supplementation on cognitive function for persons with type 2 diabetes. The secondary aim is to determine the effect of vitamin D₃ supplementation on diabetes self-management.

Methods:
Participants are being randomly assigned to either weekly 50,000 IU of vitamin D₃ (n=31) or 5,000 IUs of vitamin D₃ (n=31). The dose of vitamin D₃ (cholecalciferol) (50,000 IUs) has been safely used in other studies (Nazarian, St. Peter, Boston, Jones, & Mariash, 2011). The control group dose of 5,000 IU approximates The Institute of Medicine recommendation 600 IUs of Vitamin D per day for individuals up to age 70 (600 IUs x 7 days = 4200 IUs).

The sample includes women and men aged 55 years or greater who have type 2 diabetes, a subjective complaint of a cognitive dysfunction or scoring at least one standard deviation below normal on a cognitive functioning screening test, vitamin D deficiency (25-OH D) < 32 ng/mL, and are currently under the care of a healthcare provider.

Study measurements are being completed at a baseline visit and after participants have received the vitamin D₃ for three months. Study measures include: cognitive function using administered standardized tests (Controlled Oral Word Association Test, Animal Naming Test, Letter Number Sequencing, Stroop Interference Test, Digit Symbol Modalities Test, Trail Making Test Part B, Hopkins Verbal Learning Test), serum measurements (HBA1c, blood glucose, vitamin D levels, and cardiometabolic profile) and surveys to assess cognitive function (Social Adjustment Scale-Self Report and the Endicott Work Productivity Scale), as well as diabetes self-management behaviors (Self-Care Inventory, Diabetes Related Distress (PAIDS).

Results:

So far, 35 participants have consented and 17 have been randomized to study treatment. Among these 17 individuals, the median WRAT-IV reading subtest z-score at baseline was below average at -1.07 (IQR -1.20 to -0.40). Further, participants’ trail making test part A and part B standardized z-scores at baseline were average at $z = 0.42$ (IQR -0.33 to 0.74) for part A and $z = 0.14$ (IQR -0.55 to 0.44) for part B, respectively. Participants ability to process a cognitive interference as measured by the Stroop Interference subtest was below average at baseline ($Mdn z = -0.50$, IQR = -1.00 to 0.14) as was their verbal fluency ($Mdn z = -0.41$, IQR = -1.26 to 0.17). Among the 17 participants randomized to study therapy, their median CES-D score at baseline was 7.00 (IQR = 5.00 – 12.00). Of the 17 randomized, 13 have completed the trial. Further results of the trial will be presented at the meeting.

Conclusion:

The importance of this study is several fold. Vitamin D supplementation is a low cost intervention, it has minimal side effects, and it could have high impact for persons with type 2 diabetes who suffer from cognitive impairment which can significantly affect their diabetes self-management.