The Relationship Between MDD and Lower Vitamin D Levels in Women

March 7, 2022

Leah Kuntz

Are lower vitamin D levels in women related to depressive mood?

Valerii Honcharuk/AdobeStock

A recent study suggests vitamin D, via its effects on the brain, may play a pivotal role in the pathophysiology of major depressive disorder (MDD).[1]

Depression often follows a seasonal pattern, peaking in summer and winter.[2] Vitamin D, through its action on the brain, might account for this link between seasonal light changes and seasonal mood swings.[3] Key for neuronal development and brain function, vitamin D exerts its effects on the brain via binding to vitamin D receptors,[4] distributed in the prefrontal cortex, cingulate cortex, and limbic system.[5]

To discover more, investigators took a look at the association between gender, serum concentration of vitamin D, and depression in a large sample of 122 participants with MDD and 119 healthy controls. Resting-state functional MRI data were collected with independent component analysis adopted to examine large-scale inter- and intranetwork functional connectivity. Serum concentration of vitamin D and depression symptoms were also assessed.

Investigators observed 4 main findings.

1. There was a significant group-by-gender interaction effect on serum concentration of vitamin D. Participants with MDD exhibited lower vitamin D levels than control participants, specifically in females rather than males.

2. Female participants with lower serum concentration of vitamin D had poorer cognitive performance (ie, prospective memory and sustained attention).

3. There was a connection between MDD-related functional network connectivity changes and serum concentration of vitamin D, as well as depression and anxiety symptoms in female participants with MDD.

4. MDD- and serum concentration of vitamin D-related functional network connectivity alterations mediated the associations between vitamin D levels and cognition in females.

Investigators found that vitamin D insufficiency and deficiency was more common in females than males. MDD patients had significantly lower vitamin D levels relative to healthy controls, again specifically in females. This gender difference could be a result of insufficient sunlight exposure, higher BMI, more fat tissue, and more sedentary life in females relative to males. Overall, this may suggest a female-specific involvement of vitamin D in the pathogenesis of depression.

"More broadly, these findings may inform a novel conceptualization that adjuvant vitamin D supplementation therapy may yield clinical benefits in improving treatment outcomes in female patients with MDD," concluded the study authors.[1]

References

1. Zhu D, Zhao W, Cui S, et al. The relationship between vitamin D, clinical manifestations, and functional network connectivity in female patients with major depressive disorder. *Front Aging Neurosci*. 2022;14:817607.

2. Wehr TA, Rosenthal NE. Seasonality and affective illness. *Am J Psychiatry.* 1989;146(7):829-839.

3. Berk M, Sanders KM, Pasco JA, et al. Vitamin D deficiency may play a role in depression. *Med Hypotheses*. 2007;69(6):1316-1319.

4. Ryan JW, Anderson PH, Morris HA. Pleiotropic activities of vitamin D receptors - adequate activation for multiple health outcomes. *Clin Biochem Rev*. 2015;36(2):53-61.

5. Eyles DW, Smith S, Kinobe R, et al. Distribution of the vitamin D receptor and 1 alpha-hydroxylase in human brain. *J Chem Neuroanat.* 2005;29(1):21-30.