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Vitamin D, Depression and Coping Self-Efficacy in Young Women: Longitudinal Study

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A B S T R A C T

Depression is a significant health issue in young women with few assessment strategies for early detection. It has been suggested that self-efficacy and vitamin D levels can predict and prevent depression. The authors examined the relationship between vitamin D levels, coping self-efficacy and depression in 77 college age women over three seasons. The results of the repeated measures analysis showed that a strong, inverse relationship existed between self-efficacy and depression but not vitamin D levels. These findings were consistent across the three data collection points. The results implied that strengthening perceived coping self-efficacy may be useful in order to maintain the mental health of young college age women.

Although young adulthood is generally marked by good physical health, these years are also characterized by significant developmental changes and life events that can lead to compromised mental health and quality of life. Young adult women are at risk for developing depression, anxiety, and co-morbid substance abuse. A 2012, 12 month prevalence study conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) indicated that 8.9% of young adults in the U. S. ages 18–25 have experienced one major depressive episode as diagnosed using DSM-IV criteria, which was higher than 26–50 year olds (7.6%) and persons older than 50 (5.5%) (Substance Abuse & Mental Health Services Administration, 2013). Additionally, women of all ages had and overall higher prevalence (8.4%) of major depressive episodes when compared to males (5.5%) (SAMHSA). Moreover, this study also revealed that individuals ages 18–25 are least likely to receive treatment for depression (SAMHSA). If these mental health disorders are left undetected, untreated, or undertreated, serious consequences can occur with the most serious being suicide. Efforts to better detect and diagnose depression in young adult women is a critical health concern as are efforts to identify factors that might be protective against depression.

REVIEW OF THE LITERATURE

Vitamin D and Mood

The U. S. Department of Agriculture and Agriculture Research Service (2010) identified that all individuals over the age of 19 have been consuming far below the recommended daily intake of dietary vitamin D unless they combine a diet rich in vitamin D food sources with vitamin D supplementation. This low dietary intake is consistent among Caucasian, African American, and Hispanic individuals (U. S. Department of Agriculture). These findings have significance for young adults between the ages of 19 and 29 where 57% identify eating fast food at least one time per week (Gallup, 2013), since the majority of those foods are low in vitamin D.

Although young women may not be likely to obtain sufficient levels of vitamin D from their diets, sun exposure without the use of a skin protectant may influence their vitamin D levels. One national study indicated that 24.9% of all non-Hispanic White women 18–34 years of age participated in indoor tanning (Guy, Berkowitz, Watson, Holman, & Richardson, 2013). Despite the fact that it is possible to increase ones vitamin D levels through both natural and artificial sun exposure, due to the known risks associated with ultraviolet exposure this intervention should be taken under careful consideration.

The previous work of Kwasky and Groh (2012) identified both the lack of biological assessment tools to screen for depression as well as a relative lack of research about how vitamin D impacts mood in the young adult female population. While there continues to be a paucity of research on vitamin D and depression in young adult women, four recent studies have examined the relationship between vitamin D and depression in the general adult population. The first study conducted by Zhao, Ford, Li, and Balluz (2010) examined the relationship between serum concentrations of vitamin D or 25-hydroxyvitamin d, parathyroid hormones, and depression among US adults. The subjects consisted of a nationally representative cross sectional sample of 3,916 participants (1,890 men and 2,026 women) over 20 years of age (1,491 subjects were between 20 and 40 years of age). The results were not stratified based on gender. Each participant completed the Patient Health Questionnaire 9 (PHQ-9) and had their serum vitamin D (25(OH) D) and parathyroid hormone levels drawn. Zhao et al. indicated that the age adjusted prevalence, for having moderate-to-severe depression was 5.3% (95% CI 4.3, 6.5), 2.3% (95% CI 1.7, 3.1) for major depression

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and 3.8% (95% CI 3.0, 4.6) for minor depression. Although the results demonstrated an inverse relationship between serum concentrations of 25(OH)D and depression the results were not statistically significant after adjusting for multiple variables such as demographics, lifestyle factors and coexisting chronic conditions. Of interest is that the mean concentration of 25(OH)D was 17.8 ng/ml for participants with major depression which was significantly lower than the concentrations for participants without depression (22.0 ng/ml, $p < 0.01$). The mean 25(OH)D concentrations did not differ between participants with minor depression and no depression (21.0 v. 22.0 ng/ml, $p > 0.05$, respectively). What is interesting to note is that all of the vitamin D levels were lower than the recommended 30 ng/ml (Holick, 2009).

The second study, conducted by MinhTu et al. (2011), examined the association between low 25(OH)D and depression in a large cross-sectional sample of healthy adults (n = 12,594; age range 20–90) with a mean age of 51.7 ± 11.0 years. These participants were seen at the Cooper Clinic in Dallas, Texas between 2006 and 2010. The sample included 4,005 women (31.8%) and 8,589 men (68.2%). The study results were not stratified by gender. Depressive symptoms were measured using the 10-item Center for Epidemiologic Studies Depression Scale (CES-D), and vitamin D status was measured using serum 25(OH)D. The results demonstrated that individuals with higher vitamin D levels were at lower risk for depressive symptoms and that lower vitamin D levels were associated with depressive symptoms, particularly among individuals with a history of depression ($p = 0.02$). Additionally, vitamin D level was significantly associated with less depression from October to March (OR = 0.87; $p = 0.001$), but there was no relationship between vitamin D and depression from April to September (OR = 0.96; $p = 0.2$). The authors concluded that they were unable to identify a causal association between vitamin D levels and depressive symptoms.

The third study by Kwasky and Groh (2012) was also a cross sectional study with a descriptive correlational design that utilized a convenience sample of 139 participants from the student population on an urban university campus in the American mid-west. The researchers sought to identify if a relationship between vitamin D serum levels and depression scores in young adult women existed. Depression was measured using the Beck Depression Inventory-II (BDI-II), and vitamin D was measured using serum 25(OH)D levels at one point in time. Additionally, health problems were measured using an index of 12 health conditions: heart problems, high blood pressure, diabetes, seizure disorder, asthma, obesity, lactose intolerance, chronic pain, female problems, migraines/headaches, sickle cell anemia, and mental health problems. Descriptive statistics were run on all study variables. The African American (n = 83) participants scored lower on depression (M = 8.8) and had significantly lower vitamin D serum levels (M = 18.7 ng/mL) than the Caucasian (n = 56) students (M = 10.2, M = 32.2 ng/mL, respectively). Beck recommends that anyone scoring ≥20 be evaluated for depression, thus the researchers created two groups for comparison purposes: those who scored <20 and those who scored ≥ 20. The vast majority of participants scored <20 on the BDI-II (n = 123, 88.4%), with only 15 (10.7%) scoring ≥20. Of this group, seven (8.4% of 83) were African American, and eight (14.2% of 56) were Caucasian. Although the mean for vitamin D for those who scored ≥20 was higher than those who scored <20, the difference was not statistically significant. Pearson's correlations were calculated for the total sample (N = 139) as well as for the African American ($n = 83$) and Caucasian participants ($n = 56$) examining the relationship between depression and vitamin D serum levels. None of the correlations were statistically significant: total sample ($r = .005$, $p = .951$); African American participants ($r = .096$, $p = .390$); and Caucasian participants ($r = -.152$, $p = .265$). In addition, a Pearson's correlation was calculated for those who scored ≥20 on the BDI-II; no statistical significance was detected ($r = -.180$, $p = .52$). The results of this study were mixed. What was expected and supported was that young adult African American women would have lower vitamin D serum levels than their Caucasian counterparts. The results also identified that the mean depression score for both the African American and Caucasian students was in the minimally depressed range according to the BDI-II (0–13 indicates minimal depression).

Most recently, Khoraminya, Tehrani-Doost, Jazayeri, Hosseini, and Djasayery (2013) completed an 8 week double-blind clinical trial to examine the therapeutic effects of vitamin D as adjunctive therapy to fluoxetine in patients with a major depressive disorder. Major depressive disorder was diagnosed using the DSM-IV criteria along with a score >15 on the 17-item Hamilton Depression Rating Scale (HDRS). Participants were randomized into two groups to receive either1.5 tablets (1,500 IU) of vitamin D plus one capsule of fluoxetine 20 mg or placebo plus 20 mg fluoxetine daily for 8 weeks. Forty outpatients completed the study: the fluoxetine group (n = 20) had a mean age of 39.65 (SD 8.27), and the fluoxetine plus vitamin D group (n = 20) had a mean age of 38.1 (SD 10.07) ($p = 0.598$). Each group was comprised of three men and 17 women. The severity of depression was measured at 2-week intervals using the HDRS as the primary outcome measure and the Beck Depression Inventory (BDI) as a secondary outcome measurement. Vitamin D was measured at baseline and after the intervention using serum 25(OH)D. Study participants had not taken any antidepressant medication or dietary supplements in the 2 months prior to the study and had no other comorbid conditions. The results demonstrated that depression severity decreased significantly after the intervention, and the difference was significant between the two groups ($p < 0.05$), with the vitamin D/fluoxetine combination group demonstrating decreased depression from week four on versus fluoxetine alone.

Four limitations of the above studies were noted: (1) the relative homogeneity of the samples in terms of race and ethnicity (Kwasky & Groh, 2012; MinhTu et al., 2011); (2) use of self-reporting depression scales without clinical verification of depression status (Kwasky & Groh, 2012; MinhTu et al., 2011; Zhao et al., 2010); (3) age of samples significantly older than young adult women (Khoraminya et al., 2013; MinhTu et al., 2011); and, (4) confounding variables that were unaccounted for when interrupting the study results: seasonality (Kwasky & Groh, 2012; MinhTu et al., 2011; Zhao et al., 2010); diet (MinhTu et al., 2011), and coping strategies (Kwasky & Groh, 2012).

On-Going Clinical Trials

There are currently three ongoing clinical trials investigating the relationship between vitamin D supplementation and treatment outcomes in patients with depression. The clinical trial by Nielson et al. (2011), is investigating whether patients with depression should be offered vitamin d3 supplements (NCT01390662); Katzman and colleagues are testing if a vitamin D supplement is helpful in patients with depression who have not found relief with the use of anti-depressant medication (NCT02072187); and, Marsh is examining whether vitamin D supplementation in those with low levels may reduce depression symptoms in people experiencing bipolar depression (NCT01884844).

Self Efficacy and Depression

Self-efficacy plays a pivotal role in the process of self-management. Beliefs of personal efficacy influence what self-regulative standards people adopt, whether they think they are capable of making change, how they persevere during difficult times, and how vulnerable they are to stress and depression (Bandura, 1997). It has been hypothesized that high self-efficacy can reduce the effect of depressive symptoms, whereas low self-efficacy can increase the risk for depression, either directly or indirectly (Bandura, 1997). Several studies have tested this theory. One of the earliest was conducted by Maciejewski, Prigerson, and Mazure (2000), using a sample of 2858 respondents from the longitudinal Americans' Changing Lives study. Participants were categorized as with and without prior depression. Data on self-efficacy, life events, and depression were collected at baseline and again, 3 years later. The