

## The Correlation between 25(OH) D Vitamin D Levels and Anxiety; A Cohort Study in Elderly People in North Greece

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**Introduction:** Anxiety is a frequent and serious complication of children and adolescents receiving dialysis. Low serum vitamin D levels have been associated with anxiety in non-paediatric patients. This study sought to examine the possible association between serum vitamin D levels and the presence of anxiety in children and adolescents with dialysis in China. Psychiatric disorders such as anxiety and depression are prevalent in children and adolescents with chronic kidney disease, especially in those on dialysis. Anxiety, a part of emotional status, is one of the most frequent and important psychiatric complications among children and adolescents with dialysis. The recognition and diagnosis of anxiety is of importance because the presence of anxiety has been associated with reduced quality of life and poor social relationships in paediatric patients receiving dialysis. Compared with depression, however, data on prevalence and correlates of anxiety in children and adolescents with dialysis is limited. Vitamin D, a neurosteroid hormone, is extremely essential for human health. The profusion of vitamin D receptors (VDR) and vitamin D activating enzyme 1 $\alpha$ -hydroxylase in brain tissue suggest a key role of vitamin D in certain mental processes. A growing body of evidence demonstrates an association between low vitamin D levels and anxiety in clinical populations. Studies in animals have identified that mice lacking the vitamin D receptors gene showed an increase in anxiety-like behaviour. A recent study has showed a therapeutic effect of vitamin D on anxiety-like behaviour in female rats with long-term oestrogen deficiency. Vitamin D deficiency/insufficiency is common in children and adolescents with dialysis. To date, however, no study has examined the association between vitamin D and anxiety in children and adolescents with dialysis. Therefore, the aim of the current study was to investigate the prevalence and correlates of anxiety in children and adolescents with dialysis in China. Moreover, we examined whether low levels of vitamin D are associated with anxiety in children and adolescents with dialysis. Higher levels of anxiety, depression and internalizing problems but not typicality

were associated with lower levels of vitamin D. Vitamin D insufficiency may relate to higher levels of anxiety and depression, in turn contributing to the elevated risk of psychosis in this population. For example, the hormone cortisol, which is produced when your body is under stress, can block the calcitriol receptor and the absorption of vitamin D as a result. Therefore, if your training is causing you stress or anxiety, it may prevent you from efficiently absorbing this essential vitamin.

**Objective:** The aim of this study was to investigate the relation of 25(OH) D levels with anxiety and depression symptoms in elderly individuals. Depression and anxiety are common in elderly individuals. Vitamin D insufficiency/deficiency is common in the elderly. However, a limited number of studies has analysed the association between vitamin D levels and anxiety/depression prevalence in elderly population.

**Methods:** Data were collected from 130 elderly individuals (N=130, 60-98 years) attending the K.A.P.I of East Prefecture of Thessaloniki, from October 2015 to November 2017. Blood samples were collected during the winter periods and vitamin D levels were measured. The psychological state of the participants was assessed with the STAI, which comprises two scales: S-Anxiety and T-Anxiety. Furthermore, symptoms of depression were assessed with the CES-D scale, a useful tool for detection of this clinical entity independent of the psychological wellness. The indicated value index for the presence of depression in Greek population is greater than 9.03. The statistical data processing was carried out using the SPSS.

**Results:** Data from 130 individuals were analysed. They were classified as vitamin D sufficient (25(OH) D >30 ng/ml), insufficient (25(OH) D: 21-29 ng/ml), deficient (25(OH) D < 20 ng/ml) and severely deficient (25(OH) D

<10 ng/ml). 67.7% of the participants (n=88) were either insufficient or deficient and 5.4% of the participants (n=7) were found to suffer from severe vitamin D deficiency. 80% (n=71 of participants) of the insufficient/deficient cohort were suffering from anxiety or depression while either anxiety or depression symptoms was present in half of the participants that were vitamin D sufficient. All individuals (n=7) that suffered from both anxiety and depression were vitamin D severely deficient.

**Conclusions:** Both anxiety and depression are common in elderly individuals. Vitamin D deficiency or insufficiency may be an additional factor that promotes these conditions. Low levels of vitamin D may play a role in psychiatric disorders, as cross-sectional studies show an association between vitamin D deficiency and depression, schizophrenia and psychotic symptoms. The underlying mechanisms are not well understood, although vitamin D is known to influence the immune system to promote a T helper (Th)-2 phenotype. At the same time, increased inflammation might be of importance in the pathophysiology of depression and suicide. We therefore hypothesized that suicidal patients would be deficient in vitamin D, which could be responsible for the inflammatory changes observed in these patients. The suicide attempters in our study were deficient in vitamin D. routine clinical testing of vitamin D levels could be beneficial in patients with suicidal symptoms, with subsequent supplementation in patients found to be deficient.