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Research Article

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The Effect of Vitamin D3 Supplementation on Depressive Symptoms in Patients with Major Depression

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Abstract

Introduction and aim: Vitamin D deficiency is a global health problem. Decreased serum levels of vitamin D cause cognitive and psychiatric disorders, especially depression. Therefore, this study was conducted to evaluate the effect of vitamin D3 supplementation on symptoms of major depression.

Methods and materials: This experimental study was performed on 70 depressed patients allocated in two intervention and control groups. Drug treatment and routine psychotherapy were performed in the control group and in the intervention group, in addition to the usual treatments, vitamin D supplement capsules were prescribed for patients. The data collection tool was the Hamilton Depression Inventory. Data were analyzed by SPSS-21 statistical software using paired and independent t-tests.

Results: Results of independent t-test showed no significant difference between the two groups in terms of depression. But after the intervention, a significant difference was observed between the two groups in terms of depression. The level of depression reduced in the intervention group after the intervention.

Conclusion: Due to the effectiveness of vitamin D supplementation along with pharmacological and non-pharmacological treatments, the occurrence and exacerbation of depression symptoms can be prevented.

Keywords: Supplement • Psychotherapy • Depression

Introduction

Vitamin D is a fat-soluble vitamin. It also plays a dual role as a vitamin and hormone in the body. This vitamin is first hydroxylated in the liver and then, it is converted to 25-hydroxy vitamin D [1]. Vitamin D as a nutrient is important for maintaining health of the body. Vitamin D is absorbed from two sources; diet and sunlight [2,3]. The only enriched source of vitamin D is fish liver oil, which causes the absorption of vitamin D through the intestine [4]. Also, sunlight is another source of vitamin D, which causes vitamin synthesis to occur in the epidermis [3]. Therefore, reducing the consumption of vitamin D-rich foods, insufficient absorption of vitamin D from gastrointestinal tract, lifestyle changes, and lack of sufficient sunlight in some countries reduce the serum level of vitamin D in the body [5,6]. Vitamin D deficiency has epidemiologically prevalent worldwide [7], while vitamin deficiency has thought to be contained in the world. Nowadays, we are witnessing vitamin D deficiency all around the world [8]. Almost 30%-50% of the world's population has vitamin D deficiency. Its prevalence varies according to geographical area and weather conditions [9].

Vitamin D deficiency is a health problem in the world. It has nothing to do with social class. This issue threatens people all around the world [10]. More than one billion children and adults in the world suffer from vitamin D deficiency [11]. This rate is higher in developing countries [12]. Today, vitamin D deficiency is a global threat. Almost half of people over the age of 65 in the world are deficient in vitamin D [13]. Vitamin D deficiency has been reported in 61% of healthy Iranian adults, with 10% of whom having severe vitamin D deficiency [8]. The role of vitamin D in heart disease, diabetes, osteoporosis, and immune system is well known [14,15]. Studies show that vitamin D plays an important role in mental health and cognitive status [16]. For example, vitamin D deficiency causes obesity, inactivity and apathy [17]. Studies show that vitamin D plays an important role in the central and peripheral nervous system [18]. Clinical studies show that decreased serum levels of vitamin D in the body are associated with psychiatric symptoms such as depression [19]. Deficiency of this vitamin causes depression [20]. Taking vitamin D supplements plays an important role in increasing the serum level of 25-dihydroxy and improving depression symptoms [21]. It also plays an important role in improving sleep disorders, reducing the complications of diabetes and improving the symptoms of depression [5,22]. However, studies that examined the effect of vitamin D on the rate of depression produced conflicting results [1].

Aims and Objectives

The aim of this study was to investigate the effect of vitamin D3 supplementation on the symptoms of major depression.

Methodology

This experimental study was conducted on 70 patients admitted to the psychiatric ward of Imam Hossein Hospital in Karaj in 2018. Criteria for entering the study included; being 18-60 years old, having a diagnosis of depression by a Psychiatric specialist Diagnosis of depression was based DSM-V criteria. All participants in this study were aware of the time and place. Exclusion criteria were; not willing to participate in the study, and having an IQ of less than 70 according to the medical record. The sample size of this study was determined to be 90 people (in both intervention and control groups) based on the penkofer's study (2017), with an effect size of 0.6 at the significant level of 0.05, confidence interval of 95% and test power [23]. The participants were selected by convenience sampling and divided into both groups by random allocation method. For this purpose, the researcher prepared a list among those who met the inclusion criteria. He then separated the intervention and control groups by tossing coins. The data collection tool of this research was Hamilton Depression Inventory, which was translated to Persian and used by Mahyar Mousavi in

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1986. This questionnaire has 24 questions that were scored based on the Likert scale with 4 options. Depression was scored 24-96. A high score indicates more depression. Validity of this questionnaire has been confirmed in various studies. The reliability of this questionnaire was confirmed by correlation coefficient of 0.90 [24,25]. The reliability of this questionnaire was also confirmed in Iran by Cronbach's alpha coefficient of 95% [26]. The questionnaire was completed by patients before and after the intervention. At the time of compilation, the researcher was available to patients and answered their ambiguities and questions. In this study, the researcher, while explaining the objectives of method of study to the participants, informed them about the confidentiality of personal information and the possibility of withdrawal from study at any time. The samples in both intervention and control groups, in addition to the ward's routine care such as drug therapy, received the same counseling services.

In both groups, 30 mg of fluoxetine was administered twice a day (20 mg in the morning and 10 mg in the evening). Capsule containing 50,000 units of vitamin D was given to intervention group and capsule containing starch was given to the control group (starch capsules were given as a placebo). Placebo and vitamin D capsules were given weekly. Hamilton Depression Inventory was completed 3 months later. Then, the data were entered into SPSS-16 statistical software to be analyzed at a significance level of 0.05 using descriptive statistics (table, mean and standard deviation) and inferential statistics (paired t-test and independent t-test).

Results

The mean age of participants in the control group was 67.34 (67.6) and in the intervention group was 29.36 (9.2). Independent t-test showed no significant difference between the two groups in this regard (p=0.12). Chi-square test did not show a significant difference between the intervention and control groups in terms of gender (p=0.22) and marital status (p=0.36).

Before the intervention, the level of vitamin D in the intervention group was 20.97 ng and in the control group was 22.78 ng. Independent t-test did not show a significant difference between the two groups in this regard (p=0.83).

The mean rate of depression before the intervention in the intervention group was 29.73 (5.23) and in the control group was 28.41 (4.63). The independent t-test did not show a significant difference between the two groups in this regard (p=0.61). But after the intervention, the mean rate of depression in the intervention group was 14.7 (4.63) and in the control group was 16.33 (3.45), and independent t-test showed a significant difference between the intervention and control groups in this regard (P<0.01) (Table 1).

Paired t-test showed a significant difference in the mean depression rate of intervention group (P<0.01) and control group (P<0.01) before and after the intervention (P<0.01). However, after the intervention, the mean rate of depression was lower in the intervention group than in the control group (Table 1).

Table 1. The effect of vitamin D supplementation on depression symptoms of patients.

Time / Group	Before intervention	After intervention	P-Value
Intervention	29.73 (5.23)	14.7 (4.63)	P<0.01
Control	28.41 (4.63)	16.33 (3.45)	P<0.01
P-Value	P= 61.0	P<0.001	

Discussion

The aim of this study was to evaluate the effect of vitamin D supplement on depression symptoms of patients with major depression. The results showed that vitamin D supplement had a greater effect on reducing depression symptoms of intervention group.

Głąbska showed a relationship between vitamin D intake and depression rate [4]. Kotab stated that Vitamin D supplement plays an important role in the treatment of depression [27].Unlike other studies, Okerek showed that vitamin D supplement had no effect on depression [28]. Zarinkoob revealed that vitamin D supplement reduced dizziness and imbalance [29].

Some studies have shown that vitamin D supplemental increases the serum level of vitamin D in the body and improves the cognitive status [30]. Lie believed that vitamin D consumption plays an important role in the central-peripheral nervous system and improves cognitive status [11,18]. Tarbali showed that vitamin D consumption has a positive effect on depression in patients with multiple sclerosis [19]. Rahab believed that consumption of vitamin D supplement reduces mental health problems [31]. Mirzavani stated that use of vitamin D supplement increases serum concentrations of 1- and 25-dihydroxy vitamin D, improves the symptoms of diabetes and reduces depression symptoms [21]. The 1- and 25-dihydroxy vitamin is the active form of vitamin D that helps amygdala, which is the center of emotion and behavior in the brain [14]. Vitamin D as a nutrient is effective in maintaining health of the body [32]. Unfortunately, today are witnessing the deficiency of this vitamin in people all around the world [5]. This is while some studies have shown that use of vitamin D supplement improves depression. On the other hand, some studies have shown that taking vitamin D has no effect on depression [1,32]. However we now know that, vitamin D has a protective role in the nervous system due to the synthesis of calcium-binding protein and its antioxidant properties. This has a protective effect against depression. Vitamin D increases dopamine and serotonin by affecting neurotransmitters and as a result, it improves depression symptoms [33].

Vitamin D plays an important role in insulin secretion and function. It often helps to control blood pressure, regulate blood sugar and prevent the psychological effects of diabetes [34]. Vitamin D deficiency weakens the immune system and reduces patient compatibility [35], and this is while it is necessary to maintain patient quality of life by using educational methods and empowering patients and their caregivers to adapt to new condition [36,37]. According to the results of present study, it can be said that increasing serum levels of vitamin D improves depression symptoms in a patients with major depression.

One of the limitations of this study is the cultural and economic differences between the study samples and its small sample size. Future studies with larger sample size are suggested on this topic.

Conclusion

The results of this study showed that taking vitamin D supplements improves the symptoms of depression. However, studies have conflicting results in this regard. But it is necessary to prevent the symptoms of depression by educating and encouraging people to consume foods that contain vitamin D and also to use vitamin D supplements due to the effectiveness of vitamin D supplementation along with pharmacological and non-pharmacological treatments.

Key Message

Vitamin D as a suitable dietary supplement plays an important role in the physical and mental health of patients and also people in the community.

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