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Research Article

Application the Beck Depression Test to Screen for Depressive Findings Before and After Treatment in Patients with Iron Deficiency Anemia and/or Vitamin D Deficiency

Cem Selim

Mehmet Akif Inan Training and Research Hospital, Department of Hematology, Sanlıurfa, Türkiye

Abstract

Aim: Depression, vitamin D deficiency, and anemia are significant global public health issues. Depression, loss of interest, and a lack of enjoyment are the main warning indicators. In this study, we aimed to compare the results of the Beck depression test before and after replacement therapy in patients with iron deficiency anemia and vitamin D deficiency and to show the relationship between iron deficiency anemia (IDA), vitamin D deficiency anemia and depression in patients.

Material and Methods: 139 patients with vitamin D deficiency and/or IDA who applied to the internal medicine outpatient clinics of Dışkapı Hospital between March 2017 and September 2017 participated in the study. Patients with vitamin D deficiency and/or IDA were included in the study, and the Beck depression test (BDI) questionnaire was applied to these patients before and after their treatment. Then, the scores on these two questionnaires were compared. Statistical analyzes were performed using SPSS version 20.0 (Armonk, NY: IBM Corp.).

Results: All patients had Vitamin D deficiency, 59% (n=82) had both IDA and Vitamin D deficiency, and 41% had only Vitamin D deficiency. The mean follow-up time of the patients after treatment was 64.2±23.4 days. There was a significant decrease in BDI scores in both male patients (p=0.025) and female patients (p<0.001) after treatment compared to before.

Conclusion: In our study, it was shown that the risk of depression is high in patients with vitamin D deficiency and/or IDA, and depressive symptoms decreased after short-term replacement therapy with vitamin D and iron.

Keywords: Iron deficiency anemia, vitamın D deficiency, depression

INTRODUCTION

Erythrocyte count and/or hemoglobin levels falling below normal levels in healthy people is referred to as anemia. Hypochromia and microcytosis in erythrocytes, a decrease in serum iron and serum ferritin levels, a drop in transferrin saturation below 15%, and an increase in total iron binding capacity are all signs of iron deficiency anemia (IDA), which develops when the body is unable to meet its daily iron requirements through food and after its iron reserves have been used up. This particular form of hypochromic microcytic anemia is distinguished by Palpitations, shortness of breath, chest pain, weakness, fatigue, appetite loss, menorrhagia, hair loss, nail breakage, and dysphagia are the most common symptoms (1). Recent years have seen a rise in research on vitamin D insufficiency. Vitamin D status and bone health and development are closely related, and extensive study is being done on vitamin D in different contexts (2). Although the exact role of vitamin D in the brain is not entirely understood, it has been linked to depressive symptoms and other psychiatric illnesses

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Corresponding Author: Cem Selim, Mehmet Akif Inan Training and Research Hospital, Department of Hematology, Şanlıurfa, Türkiye
E-mail: dr.cemselim@gmail.com

because vitamin D receptors are found in parts of the brain that are involved in the onset of depression (3,4).

Depression, reluctance, loss of enjoyment in the affective field, exhaustion in the psychomotor area, slowing of behavior, slower thinking, guilt-related thoughts, and feelings of worthlessness; An major public health issue is depressive disorders, which shows up as difficulties with eating, sleeping, and engaging in sexual activity (5). Depression can be prevented in part by proper nutrition. Nutritional deficits can damage the brain's neural networks and lead to mental health issues like depression (6). Depression has been associated with some vitamin deficiencies (folic acid, vitamin B12, niacin, and vitamin C) (7). Beck Depression Scale (BDI), on the other hand, is a screening test that reduces false positive depression rates for primary care (8). There is a correlation between low vitamin D levels and depression (9) and low ferritin levels and depression, but studies on the effects of short-term vitamin D replacement and iron therapy in iron deficiency anemia have not been conducted (10).

In this study, we aimed to compare the results of the Beck depression test before and after replacement therapy in patients with iron deficiency anemia and vitamin D deficiency and to research whether replacement therapy has an effect on depressive symptoms in patients.

MATERIAL AND METHOD

The study included 139 individuals who applied to the internal medicine outpatient clinics of University Of Health Sciences Dışkapı Yıldırım Beyazıt Education And Research Hospital between March 2017 and September 2017 and had vitamin D deficiency and/or iron deficiency anemia. Each patient participating in the study was informed, their consent was obtained, and they were allowed to participate in the study voluntarily. Patients with vitamin D deficiency and/or iron deficiency anemia were included in the study, and Beck depression test, which is one of the depression screening tests, was solved in these patients before and after their treatment. Then their scores on these two questionnaires were compared. Patients with comorbidity, previously diagnosed with depression, and patients under the age of 18 and over the age of 65 were not included in the study. Patients with high Beck depression test scores were referred to the psychiatry department for further evaluation and treatment. With application number 43/26, the Ministry of Health, Health Sciences University, and Dşkap Yldrm Beyazt Training and Research Hospital got ethics committee permission for our study on November 27, 2017. According to the principles outlined in the Declaration of Helsinki, our study was conducted.

The package program SPSS version 20.0 (Armonk, NY: IBM Corp.) was used to conduct statistical analyses. Numbers, percentages, means and standard deviations, and median were used to summarize descriptive statistics. Using visual (histogram and probability graphs) and analytical techniques, the variables' conformance to the normal distribution was evaluated (Shapiro-Wilk test). In situations where there was a significant difference, post-hoc analyses using the Tukey and Bonferonni tests were carried out. The Mann Whitney U test and the Kruskal Wallis Test were used to compare non-normally distributed numerical data between two groups, respectively. The Chi-square test was used to compare the two groups' nominal data. Comparisons having a p value below 0.05 were deemed statistically significant in the study's statistical analyses.

RESULTS

The mean age of the patients was 34.2±10.7 years (median 33 years, range of 18-64 years). 90.6% (n=126) of the patients were female and 9.4% (n=13) were male. All patients (n=139) had Vitamin D deficiency, 59% (n=82) had both IDA and Vitamin D deficiency, and 41% had only Vitamin D deficiency. The mean follow-up time of the patients after treatment was 64.2±23.4 days (median 63 days, range of 13-132 days).

Table 1 shows the correlation between the markers of anemia in patients with and without iron deficiency and their vitamin D levels before and after vitamin d replacement.

Before treatment, the mean BDI scores of patients with IDA were 18.3±9.1, and patients without IDA were 20.8±9.1. There was no difference in BDI scores between patients with and without IDA (p=0.095). After treatment, the mean BDI scores of patients with IDA were 16.1±7.7, and those without IDA were 18.9±8.4. BDI scores of patients without IDA were higher than patients with IDA (p=0.046). After treatment, there was a significant increase in vitamin D levels of both patients with IDA (p<0.001) and without IDA (p<0.001) compared to pre-treatment. However, the difference in BDI scores before and after treatment was similar between patients with and without IDA (p=0.926).

Figure 1 summarizes the distribution of BDI scores before and after treatment.

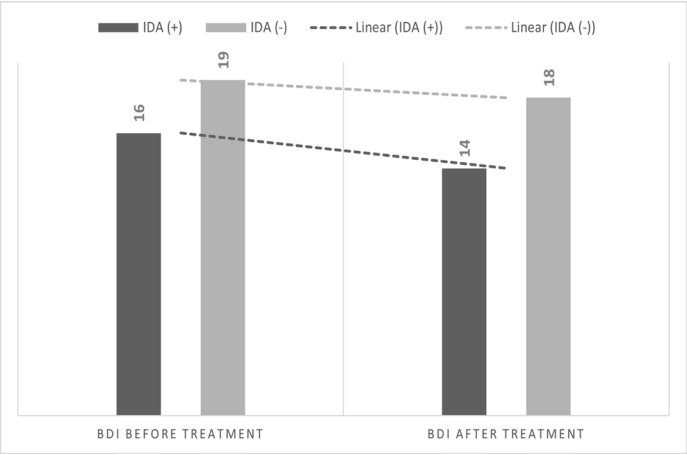

Figure 1. BDI scores before and after treatment

The presence and frequency of depression before treatment is schematized in figure 2.

In Table 3, it is shown how iron deficiency and depression's intensity and consequences compare before and after treatment. The presence and frequency of depression

Table 1. Distribution of anemia parameters in patients and vitamin D levels of patients before treatment vs after treatment			
	IDA (+) (n=82)	**IDA (-) (n=57)**	**p**
Hb (g/dl) Median (Med±SD) (Basal)	10.8 (10.5±1.0)	13.6 (13.6±1.0)	**<0.001***
Hb (g/dl) Median (Med±SD) (Control)	12.2 (12.3±0.7)	13.5 (13.5±1.0)	**<0.001***
P **	**<0.001**	0.096	
Ferritin (mg/l) Median (Med±SD) (Basal)	4.8 (7.2±9.0)	15.6 (19.0±14.6)	**<0.001***
Ferritin (mg/l) Median (Med±SD) (Control)	11.0 (13.3±10.4)	15.9 (19.9±13.7)	**<0.001***
P **	**<0.001**	0.098	
Iron (mg/dl) Median (Med±SD) (Basal)	26.0 (31.2±23.4)	56.0 (60.5±20.2)	**<0.001***
Iron (mg/dl) Median (Med±SD) (Control)	47.5 (51.7±20.9)	61.0 (61.9±17.3)	**<0.001***
P **	**<0.001**	0.350	
TIBC (mg/dl) Median (Med±SD) (Basal)	398 (388±59)	295 (274±62)	**<0.001***
TIBC (mg/dl) Median (Med±SD) (Control)	355 (347±55)	275 (269±55)	**<0.001***
P **	**<0.001**	0.177	
Vitamin D levels of patients before treatment vs after treatment			
	IDA (+) (n=82)	**IDA (-) (n=57)**	**p**
Vitamin D (ng/ml) Median (Med±SD) (Basal)	10.8 (11.4±4.1)	11.0 (11.2±3.8)	0.675*
Vitamin D (ng/ml) Median (Med±SD)(Control)	23.3 (24.3±5.6)	28.3 (28.5±5.6)	**<0.001***
P **	**<0.001**	**<0.001**	

TIBC : Total Iron Binding Capacity
* Mann Whitney U test
**Wilcoxon Signed Rank Test

Table 2. BDI scores of the patients before and after treatment			
	IDA (+) (n=82)	**IDA (-) (n=57)**	**p**
BDI Median (Med±SD) (Basal)	16 (18.3±9.1)	19.0 (20.8±9.1)	0.095*
BDI Median (Med±SD)(Control)	14 (16.1±7.7)	18.0 (18.9±8.4)	**0.046***
P **	**<0.001**	**<0.001**	
BDI Difference Median (Med±SD)	2.0 (2.1±3.4)	2.0 (1.9±1.6)	0.926*

* Mann Whitney U test
**Wilcoxon Signed Rank Test

Table 3. Frequency and severity of depression before treatment vs after treatment				
Presence and severity of depression	**Before treatment**		**After treatment**	
	IDA (+) (n=82)	**IDA (-) (n=57)**	**IDA (+) (n=82)**	**IDA (-) (n=57)**
None n (%)	33 (40.2)	13 (22.8)	35 (42.7)	18 (31.6)
Mild depression n (%)	17 (20.7)	16 (28.1)	27 (32.9)	16 (28.1)
Moderate depression n (%)	20 (24.4)	16 (28.1)	12 (14.6)	15 (26.3)
Severe depression n (%)	12 (14.6)	12 (21.1)	8 (9.8)	8 (14.0)
p	**0.032**		0.185	

*Chi-square test

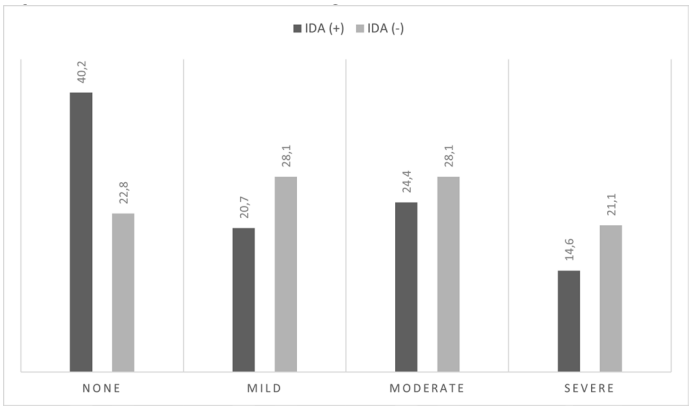

Figure 2. Frequency of depression before treatment

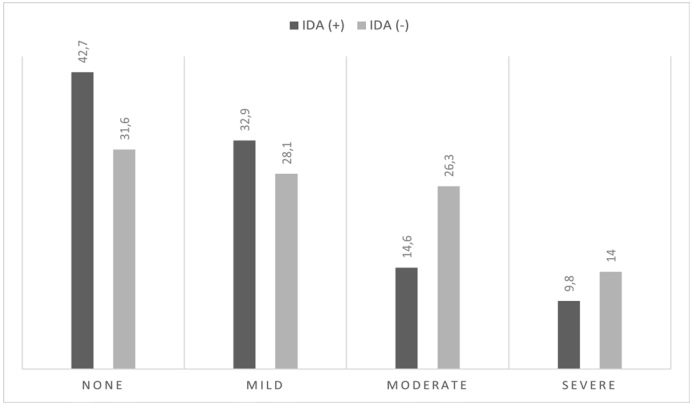

Figure 3. Frequency of depression after treatment

The mean BDI score of male patients before treatment was 21.2±7.9, and 19.1±9.3 for females. Pre-treatment BDI scores did not differ between genders (p=0.279). The mean BDI score of male patients after treatment was 18.7±7.7, and 17.1±8.1 for females. Post-treatment BDI scores were similar (p=0.438). There was a significant decrease in BDI scores in both male patients (p=0.025) and female patients (p<0.001) after treatment compared to before.

DISCUSSION

The World Health Organization identifies IDA as the most prevalent dietary deficit. IDA affects women, adolescents, and children at a rate of 30% in undeveloped cultures (11). The neurological, autoimmune, endocrine, and cardiovascular systems all depend on iron for the composition of hemoglobin, myoglobin, and many enzymes (12). Iron has a role in the myelination of white matter during brain development and modulates the actions of neurotransmitters like dopamine, norepinephrine, and serotonin (13). Because IDA is connected to changes in monoamine neurotransmitters, it has been specifically linked to psychiatric problems (12). A major contributor to disability, depressive disorders afflict 121 million individuals globally. It is listed by WHO as having the fourth-highest global burden of disease (14). There is mounting proof that vitamin D lowers the risk of mental health issues. The link between vitamin D and depression is attributed to the presence of vitamin D receptors in the brain. Vitamin D receptors are found in neurons and glia in the cingulate cortex and hippocampus, among other areas of the brain. Many central functions, including brain growth, neuroplasticity, neuroprotection, control of neurotrophic factors, and neuroimmunomodulation, are influenced by vitamin D. The pathogenesis of depression has been linked to the roles of vitamin D in central processes. It is hypothesized that vitamin D influences mood through inducing the stress response in this manner (16,30). Vitamin D supplementation may be beneficial in the treatment of depression since some theories claim that vitamin D deficiency has a substantial impact on the development of depression and other mental illnesses (16). Data on the early effects of IDA short-term replacement treatment and vitamin D insufficiency on depression, however, are scarce. In this study, we examined the short-term effects of replacement therapy on patients with IDA and/or vitamin D insufficiency for depression and depressive mood.

The initial unexpected result of our investigation was that both patients with vitamin D insufficiency and patients with vitamin D deficiency plus IDA saw a significant drop in BDI scores after taking replacement therapy (p 0.001 for both groups). Our study showed that iron and/or vitamin D replenishment for a short time (median 63 days) had a positive effect on depressive symptoms. On the other hand, around 80% of patients with vitamin D deficiency and about 60% of patients with IDA both had depression. Although there have been many studies on IDA, few have looked at how it affects mood and psychological outcomes. According to recent evidence, IDA patients have an increased risk of developing depression (12,17, 18-19). Also, there are very few studies assessing the depth and severity of depression following IDA treatment.

In the study conducted by Shariatpanaahi et al. (10), ferritin levels and BDI scores of 192 students were evaluated. It was shown that people with depression had lower ferritin levels than individuals without depression. According to the study, in people who have not yet developed anemia, there is a correlation between a drop in ferritin levels and depression.

In a 2012 study by Khalafallah et al., the impact of iron replacement therapy on 183 IDA patients' quality of life and depression was assessed. Health-related quality of life (HRQoL) subscales for general health, depression, and vigor all showed significant improvement after 4 weeks of replacement therapy. The results of our investigation support short-term replacement therapy's beneficial improvement in depression (19). On the other hand, caution should be taken when interpreting our findings because this study included pregnant women.

The students in secondary schools were evaluated in the study by Mansson et al. (21). It was shown that IDA existed in 12% of the students. With iron supplementation, the patients' symptoms of dizziness, restlessness, and depression were shown to diminish. In contrast, this study evaluated the patients' symptoms using the 30-question subjective scale created by the author.

Pamuk et al. (22) 2015 saw the BDI scale used to evaluate 125 IDA and 57 controls. In the study, 71 patients (56.2%) had depression. This rate is really close to what our investigation revealed. Also, this study showed that IDA symptoms can have an impact on depression and quality of life.

Onder et al. (23), 986 patients were evaluated in terms of anemia and depression. Anemia was found in 48 (15%) of 313 patients with depression and 53 (8%) of 673 patients without depression in this study, which used the Epidemiology Studies Central Depression Scale (CES-D) to measure depressive symptoms. Also, it was found that the risk of anemia rose as CES-D scores rose. The study's findings indicated that anemia and depressed symptoms were related.

In a study conducted by Son et al. (24) in 2011, 388 patients' anemia and depression were assessed. The cognitive abilities of anemic patients were lower, and anemic patients with worse cognitive functions were more likely to experience depression, according to this study, which supported the geriatric depression scale.

In a 2012 study by Stewart et al. (25) that analyzed 1875 patients, it was discovered that depressed symptoms were connected to anemia. Lower serum ferritin levels have also been demonstrated to be related to depressive symptoms. However, our study found no statistically

significant relationship between serum ferritin and BDI scores (p=0.062). Yet, studies including a larger patient group can find this connection.

Moy et al. (26) examined the connection between vitamin D insufficiency and depression in a cross-sectional investigation. According to the Depression, Anxiety, and Stress Scale (DASS) 21 scale, two-thirds of people with vitamin D insufficiency are at risk for developing depression. In our investigation, vitamin D supplementation was demonstrated to have beneficial effects on depression in addition to the high prevalence of depression in vitamin D insufficiency. The findings of our investigation were particularly in line with the literature data that had been published in the previous ten years.

In a study conducted by Spedding (27) in 2014, the effect of vitamin D supplementation on depression was evaluated. A meta-analysis of 15 randomized controlled studies found that supplementing with vitamin D reduced depressive symptoms. Also, it has been claimed that vitamin D has a similar impact on depression as antidepressants. The conclusions are however constrained by the heterogeneity of the papers analyzed in the meta-analysis.

According to a 2017 meta-analysis by Parker et al. (28) vitamin D insufficiency is linked to an increase in the occurrence of depression. Studies examining the impact of vitamin D supplementation on depression, however, have shown mixed findings.

The efficiency of treatment was assessed in major depressive patients with vitamin D insufficiency in a randomized controlled research by Sepehrmanesh et al. (29) in 2015. Patients who took weekly vitamin D supplements of 50,000 IU for eight weeks were contrasted with placebo-administered controls. By using the BDI to assess results, it was found that the group getting vitamin D supplements had significantly lower BD ratings than the controls.

In the study carried out by Mozaffari-Khozravi et al. (30) in 2013, 120 patients were placed into three groups, each having a BDI score of 17 or above and low vitamin D levels. The third group received no treatment, while the first group received a single dose of 300,000 IU and the second group received a single dose of 150,000 IU. Three months later, depression and vitamin D levels were assessed again, and only the 300,000 IU therapy group showed a discernible rise in BDI ratings. The study revealed that vitamin D deficiency could be corrected and that a dose of 300,000 IU was more beneficial than a dose of 150,000 IU in treating depression.

In our investigation, it was discovered that individuals with vitamin D insufficiency and/or IDA had a higher chance of developing depression, and that this risk was reduced after receiving short-term replacement therapy with vitamin D and iron. There are a lot of data about how depression is more common in people with IDA and vitamin D insufficiency, but there aren't as many about how short-term replacement therapy affects depression. These data have been expanded by our research. Several specialties are aware of vitamin D insufficiency and the direct impact of IDA on patients.

Vitamin D deficiency and IDA are both common. Nevertheless, not enough is known about how patients' emotional state and quality of life affect them. In light of our findings, it can be concluded that prompt planning of their treatments, particularly for IDA and vitamin D insufficiency, especially in depressed individuals, will ensure that beneficial results even early in the early phase.

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Conflict of Interest: *The authors have no conflicts of interest to declare.*

Ethical approval: *With application number 43/26, the Ministry of Health, Health Sciences University, and Diskapi Yildirim Beyazit Training and Research Hospital got ethics committee permission for our study on November 27, 2017.*

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