Research Article / Araştırma Makalesi

The Relationship Between Vitamin D and Left Ventricular Function in Thalassemia Major Patients

Talasemi Major Hastalarında D Vitamini ile Sol Ventrikül Fonksiyonu Arasındaki İlişki

Defne AY TUNCEL [1], Şule ÇALIŞKAN KAMIŞ [1], Begül YAĞCI-KÜPELİ [1]

[1]Health Sciences University, Adana Faculty of Medicine, Adana City Training and Research Hospital, Department of Pediatric Hematology and Oncology, Adana, TÜRKİYE

Abstract

Background: Our goal was to evaluate a correlation vitamin D levels(VDL) with left ventricular function (LVF) in Thalassemia Major (TM) patients.
Materials and Methods: Patients with TM who presented to the PHOC at Adana Faculty of Medicine, Health Sciences University, Adana City Training and Research Hospital(ACTRH) during June 1, 2022 and June 1, 2023, were eligible for the study. Routine investigations were performed, and data on 25-Hydroxyvitamin D (25(OH)D) levels, ferritin values, Echocardiography (ECHO) Ejection Fraction (EF), and Fractional Shortening (FS) were obtained from patient records .
Results: The study included 89 patients of TM. The female ratio was 46.1% (n=41), while 53.9% were male (n=48). The cases ranged in age from one to twenty-four years, with a median of ten. Out of the cases, 84 were between the ages of 0 and 18 (94.4%), with 5 over the age of 18 (5.6%). The median ferritin level was 1497 µg/L (68-11354), VDL was 18 µg/L (3-52), EF was 66 (37-77), and FS was 36 (21-67). A significant inverse correlation was found in VDL with ferritin levels in TM patients. (p=0.026, r=-0.235).
No correlation was found between VDL, EF, and FS levels in TM patients (p=0.684, r_0.44; p=0.082, r=0.185).
Conclusions: An inverse relationship was observed between iron burden and VDL in patients diagnosed with TM. Although cardiac dysfunction is a consequence of iron accumulation, this study did not reveal significant cardiac impairment in patients with low VDL. Available data do not support the direct effects of this deficiency on cardiac systolic functions. These findings highlight the importance of monitoring vitamin D status and controlling iron load in Thalassemia major patients.

Keywords: 25(OH)D, Thalassemia Major, Ferritin

Öz

Amaç: Talasemi Major (TM) hastalarında D vitamini düzeylerinin (VDL) sol ventriküler fonksiyon (LVF) ile ilişkisini değerlendirmeyi amaçladık.
Materyal ve Metod: 1 Haziran 2022 ve 1 Haziran 2023 tarihleri arasında Adana Tıp Fakültesi, Sağlık Bilimleri Üniversitesi, Adana Şehir Eğitim ve Araştırma Hastanesi'nde (AŞEAH) pediatrik hematoloji onkoloji kliniğine başvuran TM'li hastalar çalışmaya alınmıştır. Rutin tetkikleri yapılarak, 25-Hidroksivitamin D (25(OH)D) düzeyleri, ferritin değerleri, Ekokardiyografi (EKHO) Ejeksiyon Fraksiyonu (EF), Fraksiyonel Kısalma (FS) verileri hasta kayıtlarından elde edildi.
Bulgular: Çalışmaya 89 TM hastası dahil edildi. Kadın oranı %46,1 (n=41), %53,9'u erkek (n=48) idi. Vakaların yaşları bir ile yirmi dört yaş arasında değişiyordu ve ortalama on yaş idi. Vakaların 84'ü 0-18 yaş arasında (%94,4), 5'i (%5,6) 18 yaş üzerindeydi. Medyan ferritin düzeyi 1497 µg/L (68-11354), VDL 18 µg/L (3-52), EF 66 (37-77) ve FS 36 (21-67) olarak belirlendi. Anlamlı bir ters korelasyon TM hastalarında ferritin düzeyleri ile VDL bulundu. (p=0,026, r=-0,235).
TM hastalarında VDL, EF ve FS düzeyleri arasında korelasyon saptanmadı (p=0,684, r_0,44; p=0,082, r=0,185).
Sonuç: TM tanısı alan hastalarda demir yükü ile VDL arasında ters ilişki gözlendi. Kardiyak disfonksiyon demir birikiminin bir sonucu olmasına rağmen, bu çalışma düşük VDL'li hastalarda anlamlı kalp bozukluğunu ortaya koymamıştır. Mevcut veriler bu eksikliğin kardiyak sistolik fonksiyonlar üzerindeki doğrudan etkilerini destekleyememektedir. Bu bulgular Talasemi Major hastalarında D vitamini durumunun izlenmesinin ve demir yükünün kontrol edilmesinin önemini vurgulamaktadır.
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Anahtar Kelimeler: 25(OH) vitamin D, Talasemi Major, Ferritin

Corresponding Author / Sorumlu Yazar

Dr. Defne AY TUNCEL
Health Sciences University, Adana Faculty of Medicine, Adana City Training and Research Hospital, Department of Pediatric Hematology and Oncology, Adana, TÜRKİYE

E-mail: defneayinan@gmail.com

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Introduction

Thalassemia major (TM) is an inherited disease observed in beta-globin chains (1). The clinical manifestations of TM typically emerge between the ages of 6 to 24 months (2). Individuals with TM suffer from severe chronic hemolytic anemia, necessitating regular blood transfusions from early childhood (3-5). The life expectancy of TM patients has increased with transfusion and iron chelation therapy (6). Transfusion-related complications include iron overload, transfusion reactions, and infections (7). Accumulation of iron in the heart, lungs, and liver can lead to functional impairments (8). Inpatients receiving blood transfusions, heart failure due to myocardial iron overload can be observed in TM patients. (9, 10). It is believed that other factors may contribute to cardiac dysfunction caused by iron overload. Studies have reported that vitamin D levels (VDL) may be associated with left ventricular function (LVF) (11-13). We investigated the relationship between VDL and LVF in patients diagnosed with TM who have been followed up in our clinic.

Materials and Methods

Study Population

Patients with TM who presented to the thalassemia unit at Adana Faculty of Medicine, Health Sciences University, Adana City Training and Research Hospital during June 1, 2022 and June 1, 2023, were eligible for the study. Patients with incomplete hospital records, those without echocardiographic results, those who had not had their 25-Hydroxy vitamin D (25(OH)D) levels checked, and those aged 25 and up were excluded from the study.

Data Collection

Routine investigations were performed for all eligible patients, including the assessment of 25(OH)D levels, ferritin values, and echocardiographic (ECHO) measurements, which included Ejection Fraction (EF) and Fractional Shortening (FS). Data were recorded from patient records or the hospital's electronic medical records system.

Vitamin D Classification

VDL was classified as follows: 0-20 µg/L indicated a vitamin D deficiency, 20-30 µg/L indicated vitamin D insufficiency, and 30-100 µg/L indicated sufficiency. An adequate VDL can be achieved by following the reference guidelines (14-16).

Statistical Analysis

The statistical analysis for this study was conduct edutilizing version 26 of 'Social Sciences package of statistical program'(NY,USA IBM Corp.).Descriptive statistics are used for patients' demographic data. Categorical measurements were presented in both number and percentage, while numerical measurements were represented as means and standard deviations. The normality of numerical measurements was determined using the Kolmogrov-Smirnov test. In comparisons between two groups with non-normally distributed numerical measurements, the Mann-Whitney U test was used instead of the Independent Samples Student's t-test, which is used when two groups have normally distributed data. To assess the relationship between variables, correlation analysis was used. If the variables were normally distributed, Pearson correlation analysis was used; otherwise, Spearman correlation analysis was used. All tests used a p-value of ≤0.05 to indicate significance. In all analyses, p-values of 0.05 or lower were accepted.

Results

From June 1, 2022 to June 1, 2023, routine examinations of 25(OH)D levels, ferritin values, ECHO, EF, and FS data were scanned from the medical records or hospital system of 161 patients diagnosed with TM and followed up in the thalassemia unit. The study included 89 patients diagnosed with TM. Of the patients, 46.1% (n=41) were females and male was53.9% (n=48).Patients ages are between1 and 24, the mean ratio was10. 84 of the cases (94.4%)was between 0 and 18 oldages, above 18 oldages of 5 (5.6%).Ferritin median range was 1497 µg/L (range 68–11354), the 25(OH)D value was 18 µg/L (range 3-52), the EF value was 66 (range 37–77), and the FS value was %36 (range 21–67). Vitamin D deficiency was detected in 49 patients (55.1%), vitamin D insufficiency in 28 patients (31.5%), and vitamin D sufficiency in 12 patients (13.5%). (Table 1) There was a significant inverse correlation found between VDL and ferritin levels in TM patients (p=0.026, r=-0.235). There was no correlation found between VDL and EF levels in TM patients (p=0.684, r=0.44). There was no correlation found between VDL and FS levels in TM patients (p=0.082, r=0.185).

Table 1. Patient clinical data distribution

Clinical data	Number of Patients (Percentage)
Total number of Patients	89 (100%)
Female	41 (46.1%)
Male	48 (53.9%)
Median Age	10
Age 0-18	84 (94.4%)
Age >18	5 (5.6%)
Vitamin D Deficiency	49 (55.1%)
Vitamin D Insufficiency	28 (31.5%)
Vitamin D Adequacy	12 (13.5%)

Discussion

TM is characterized by anemia that necessitates recurrent-red bloodcell (RBC) transfusions (17). Iron accumulates in the body due to recurrent blood transfusions (18). Cardiovascular diseases are frequently observed due to iron overload (19). In a study conducted by Meloni et al., myocardial

iron overload in TM patients was associated with ventricular dysfunction, myocardial fibrosis, and the risk of heart failure (20). Studies have reported that the VDL of TM patients who have received repeated blood transfusions are found to be low in approximately 90% of cases (21,22). According to there search by Santra et al., although TM patients do not exhibit low serum calcium levels, their VDL are reported to be lower than those of healthy individuals (23).
Pishgahi et al. found that vitamin D deficiency in TM patients is associated with systolic dysfunction (24).In this research, there was no significant correlation found between VDL and EF values in TM patients (p=0.684, r=0.44). However, it was a significant inverse correlation between VDL and ferritin ratio in TM (p=0.026, r=-0.235). Similarly, there was no significant correlation between VDL and FS values in TM patients in ourstudy (p= 0.082, r= 0.185).These findings underscore the complex interplay between iron overload, vitamin D deficiency, and cardiac function in TM patients. While vitamin D deficiency and iron overload are common in these individuals, no correlation was found between VDL and LVF in our study.
Vitamin D deficiency has been associated with negative effects on myocardial relaxation and diastolic functions, and some studies suggest it may contribute to myocardial hypertrophy and systolic dysfunction. However, a clinical study conducted on patients with thalassemia major found no significant correlation between vitamin D levels and systolic function parameters (EF: p=0.684, FS: p=0.082), and no notable cardiac impairment was observed in this group (25).

Conclusion

TM patients were found to exhibit an inverse relationship between iron overload and VDL. While cardiac dysfunction can be a consequence of iron accumulation, this study did not find significant cardiac problems in individuals with low VDL. This highlights the need for comprehensive management and monitoring to address the multifaceted health challenges faced by TM patients. More research is needed to improve heartfunction in individuals with TM.

Ethical Approval: It was approved by Ethics commitee of Adana Faculty of Medicine, Health Sciences University, Adana City Training and Research Hospital on June 8, 2023, during the 128th meeting, decision number 2639

Author Contributions:
Concept: D.A.T.
Literature Review: Ş.Ç.K.
Design : D.A.T.
Data acquisition: Ş.Ç.K.
Analysis and interpretation: B.Y.K.
Writing manuscript: D.A.T.
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