

ASSOCIATION OF SERUM 25-HYDROXYVİTAMİN D LEVELS WITH HEMOGLOBİN

SERUM 25-HİDROKSİVİTAMİN D DÜZEYLERİNİN HEMOGLOBİNLE İLİŞKİSİ

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Anahtar Sözcükler: 25-hidroksivitamin D, hemoglobin, anemi

Keywords: 25-hydroxyvitamin D, hemoglobin, anemia

Yazının alınma tarihi: 09.08.2018

Kabul tarihi: 14.02.2019

Online basım: 29.07.2019

ÖZ

Giriş: Anemi ve D vitamini eksikliği çok önemli sağlık problemlerindedir ancak popülasyondaki D vitamini ile hemoglobin ve anemi ilişkisi açıklık kazanmamıştır. Biz çalışmamızda D vitamini düzeyleri ile anemi tanısı ve şiddetini belirleyen hemoglobinin ilişkisini değerlendirmeyi amaçladık.

Gereç ve Yöntem: 2228 olguda yapılan retrospektif çalışmada 25-hidroksivitamin D düzeylerine göre 4 grup oluşturuldu (<10 ng/mL, 10-19 ng/mL, 20-29 ng/mL, >30 ng/mL). Serum 25-hidroksivitamin D düzeyleri ve hemoglobin, kırmızı kan hücre sayısı, ortalama korpusküler hacim, kırmızı hücre dağılım genişliği seviyeleri değerlendirildi.

Bulgular: 25-hidroksivitamin D düzeyleri ile hemoglobin arasında pozitif korelasyon tespit edildi. Aynı zamanda Grup 1 (25-hidroksivitamin D <10 ng/mL) ile diğer 3 grup arasında hemoglobin ve kırmızı kan hücre sayısının anlamlı farklılıklar gösterdiği saptandı ($p<0.05$). Ancak hemoglobin, kırmızı kan hücre sayısı, kırmızı hücre dağılım genişliği ve ortalama korpusküler hacim diğer gruplar arasında anlamlı farklılık göstermiyordu ($p>0.05$).

Sonuç: D vitamini eksikliğinizi özellikle 10 ng/mL'nin altında olması durumunda artmış anemi riski ile ilişkili olabileceği düşünüldü.

SUMMARY

Introduction: Anemia and vitamin D deficiency are both important health issues, however the association between vitamin D and either hemoglobin or anemia remains unresolved in the population. We aimed to evaluate the association between vitamin D and hemoglobin levels since the hemoglobin concentrations can provide diagnosis of anemia and assessment of its severity.

Material and method: A retrospective study was performed and 2228 subjects were classified into 4 groups according to their 25-hydroxyvitamin D levels (<10 ng/mL, 10-19 ng/mL, 20-29 ng/mL, >30 ng/mL). Serum 25-hydroxyvitamin D levels, hemoglobin, red blood cell count, mean corpuscular volume and red cell distribution width values were evaluated.

Results: There was a significant positive correlation between 25-hydroxyvitamin D levels with hemoglobin levels. Also we found a significant difference between Group 1 (25-hydroxyvitamin D <10 ng/mL) and other 3 groups by means of hemoglobin and RBC ($p<0.05$). There were no significant differences in hemoglobin, red blood cell count, mean corpuscular volume, red cell distribution width levels between other groups ($p>0.05$).

Conclusion: We conclude that vitamin D deficiency is associated with increased risk of anemia especially when its levels are below 10 ng/mL.

INTRODUCTION

Anemia is a major global health concern due to its high prevalence and association with substantial morbidity and mortality. Anemia is currently defined by the World Health Organization (WHO) as a hemoglobin (Hb) level lower than 13 g/dL in men and 12 g/dL in women (1, 2). Vitamin D deficiency is also an important issue in public health because it is associated with a wide range of illnesses and chronic conditions, such as osteoporosis, cancer, metabolic syndrome and cardiovascular disease (3). Anemia and vitamin D deficiency are extremely common and widespread disorders in the world (4,5).

Some studies have suggested a relationship between iron deficiency and low 25-hydroxy vitamin D (25(OH) vitamin D) levels (6,7). Anemia and vitamin D deficiency are both important health issues; however, the nature of the association between vitamin D and either Hb or anemia remains unresolved in the general population.

The relationship between these two deficiencies is not clear, but seems to be reciprocal. On one hand, clinical observations suggest a role of 25(OH)vitamin D in erythropoiesis, as this hormone directly stimulates erythroid precursors (8,9). Lower 25(OH)vitamin D levels have been associated with anemia/lower Hb values in population-based samples of adults (10,11) and in adults with non-dialysis chronic kidney disease and end-stage kidney disease (12-14), end-stage heart failure (15), and Type 2 diabetes (16). Furthermore, retrospective cohort studies in adults have demonstrated that vitamin D supplementation may improve anemia management and decrease dose requirements for erythropoiesis stimulating agents, suggesting that vitamin D plays a role in erythropoiesis (17,18). So vitamin D deficiency may associate with increased risk of anemia.

The objective of this study was to examine the association of 25(OH)vitamin D levels with Hb levels demonstrating anemia status.

MATERIAL AND METHOD

This study was performed retrospectively by scanning the hospital information system in the Health Sciences University Izmir Bozyaka

Education and Research Hospital at Medical Biochemistry Department. A total of 2228 subjects (1889 women (84.78%) and 339 (15.22%) men) were included in the study and subjects were classified into 4 groups according to their 25(OH)vitamin D levels. Group 1: <10 ng/mL; Group 2: 10 - 19 ng/mL; Group 3: 20 - 29 ng/mL and Group 4: ≥30 ng/mL.

In this study anemia was defined as a Hb level of <13 g/dL in men and <12 g/dL in women, in accordance with the World Health Organization's definition of anemia. The selected patients did not have any primary active or chronic disease diagnosis, like diabetes, cardiac, renal, hepatic or endocrine diseases, also they were not diagnosed with anemia.

Serum 25 (OH)vitamin D levels were measured by chemiluminescence method (Beckman Coulter, CA, USA) by using Beckman Coulter DXI 800 analyzer. Complete blood counts were analyzed by Mindray BC5800 otoanalyzer. The internal and external quality controls of the devices were acceptable at the relevant time.

Statistical analysis

All data were analysed using the statistical software package SPSS Statistics version 21. Kolmogorov Smirnov test was used to see the normality of the distribution. Spearman test was used for correlation of 25 (OH)vitamin D and Hb, RBC, RDW, MCV levels. For comparison of 25(OH)vitamin D and these parameters between groups Man Whitney U test was used. Values were showed as means ± standard deviations. P values <0.05 were considered statistically significant.

RESULTS

This cross-sectional and 7 months retrospective study includes 2228 subjects with a mean age of 51.5±16.8 years. 25(OH)vitamin D and Hb, RBC, RDW, MCV levels of groups were showed in Table 1.

Anemia was present in 32.3% of all subjects and 36.2% in Group 1; vitamin D deficient subjects (<10 ng/mL).

There were significant correlation between 25 (OH)vitamin D levels with Hb ($r=0.81$, $p=0.00$) but there were no correlations between 25 (OH)vitamin D levels with other parameters.

Table 1. 25(OH)vitamin D and hemoglobin, RBC, RDW, MCV levels of groups.

Parameter	Group 1 (n=376)	Group 2 (n=994)	Group 3 (n=401)	Group 4 (n=457)
AGE (year)	52.7 ± 16.5	50.1 ± 16.5	48.4 ± 17.9	56.1 ± 1.4
25(OH)D (ng/mL)	7.81 ± 1.7	14.5 ± 2.9	24.1 ± 2.8	48.8 ± 22.8
Hb (g/dL)	12.3 ± 1.5	12.7 ± 1.6	12.8 ± 1.8	12.7 ± 1.5
RBC (10 ⁶ /μL)	4.4 ± 0.5	4.5 ± 0.5	4.5 ± 0.5	4.6 ± 0.5
RDW (%)	13.8 ± 2.3	13.4 ± 1.7	13.5 ± 1.9	13.9 ± 1.9
MCV (fL)	84.8 ± 7.9	84.7 ± 7.9	85.2 ± 7.9	84.8 ± 7.4

(25(OH)D: 25 hydroxy vitamin D, Hb: Hemoglobin, MCV: mean corpuscular volume, RBC: red blood cells, RDW: red cell distribution width).

There were significant differences between group 1 and other 3 groups by means of Hb and RBC ($p < 0.05$). But there were no significant differences in Hb, RBC, RDW, MCV levels between group 2, 3 and 4 ($p > 0.05$).

Mean 25(OH) vitamin D levels of groups and their Hb ratios were shown in Figure 1.

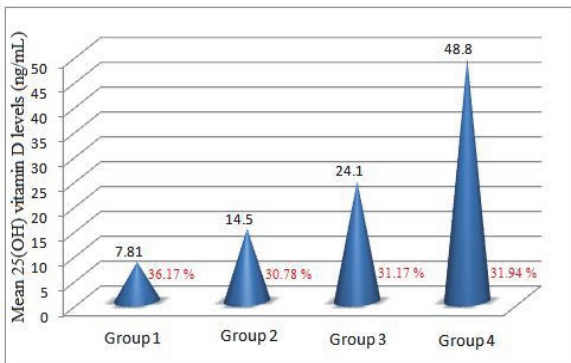


Figure 1. Mean 25(OH)vitamin D levels (ng/mL) of groups and their anemia ratios.

DISCUSSION

Anemia and vitamin D deficiency are both important health issues, however the relationship between these two deficiencies is not clear.

25(OH)vitamin D is known for its crucial role in bone and mineral metabolism and is increasingly recognized to have extraskeletal effects on immune function, cell proliferation and differentiation, and cardiovascular function (19,20). The role of vitamin D in erythropoiesis has been suggested by several clinical observations. Vitamin D has been demonstrated in bone marrow to affect marrow function. There are data to suggest that inadequate levels of 25(OH)vitamin D leading to decreased local

calcitriol production in the bone marrow may limit erythropoiesis (10,18,21).

In some studies, lower levels of 25(OH)vitamin D have been independently associated with lower Hb levels and anemia in adults with heart failure, diabetes, and chronic kidney disease, including dialysis-dependent chronic kidney disease (12-15). This association also has been observed in otherwise-healthy adults (10) and in adults with ages of 60 years and older in the National Health and Nutrition Examination Survey (NHANES) III (1988-1994) and 2001-2006 cohorts (11).

Some other studies demonstrated an association between vitamin D deficiency and greater risk of anemia and lower Hb levels like our study. Sim et al. showed that 25(OH)vitamin D deficiency was associated with lower Hb levels (10). The other study demonstrated that in a large population based cohort of healthy children lower 25(OH)vitamin D levels were associated with increased risk of anemia (22). Also Lee JA et al. concluded that vitamin D deficiency was associated with increased risk of anemia, especially iron deficiency anemia in healthy female children and adolescents (23). Blanco-Rojo et al. and Shin JY et al. showed that vitamin D deficient women had a higher risk of anemia (4,24).

Contrary to these findings Li Chang et al. found that there was no significant relationship between 25(OH)vitamin D levels and Hb in 1218 children (25) which is similar to results by Abdul-Razzak et al. (26) and Kersey et al. (27). Also Öztürk et al. found no significant differences in RBC, Hb, and RDW between the groups when they group vitamin D levels like us. Also, they found no correlation between the blood count parameters and 25 (OH) vitamin D (28).

The objective of this study was to examine the association of 25(OH)vitamin D levels with Hb levels since the anemia is defined by the Hb levels according to WHO. There was no significant difference of Hb and vitamin D levels when 25(OH)vitamin D levels were above 10 ng/ml. We thought that when vitamin D levels were very low in that case it could effect the anemia status of patients. Also we found positive correlation between 25(OH)vitamin D levels and Hb, we thought that inadequate levels of 25(OH)vitamin D might affect bone marrow function and increase the anemia risk.

We conclude that vitamin D deficiency is associated with increased risk of anemia especially when its levels are below 10 ng/mL. Although our study found a correlation between

vitamin D deficiency and Hb, a causal relationship cannot be established. As a result, further studies are needed to clarify the association between vitamin D deficiency and anemia since the relationship between these two deficiencies is not clear. Also factors such as nutrition, medications and infections should be considered to conclude reliable association between vitamin D and anemia. As this study is retrospective the other causes of vitamin D deficiency can not be questioned, such as exposure to sunlight, nutrition, obesity etc. This is the limitation of this study. Correction of anemia and 25(OH)vitamin D deficiency is an issue of great importance in public health. So when the clinicians detect the vitamin D deficiency, they must consider the possible anemia.

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Sorumlu yazar

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