

Evaluation of the correlation of 25-hydroxyvitamin-D serum levels with allergic rhinitis

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Abstract

Objective: Recent studies point to a relationship between allergic diseases and vitamin D deficiency. This relationship seems to be associated with immune-modulator effects of the derivatives of vitamin D. However, there are limited number of studies on the relationship between allergic rhinitis and derivatives of vitamin D. We planned our study to investigate this issue.

Methods: The study group was composed of 30 patients diagnosed with allergic rhinitis according to ARIA (Allergic Rhinitis and its Impact on Asthma) Criteria. The control group included 30 patients of the same age and gender without any allergic rhinitis disease. The patients with an underlying disease which may cause deficiency of calcium and vitamin D were excluded. The significance of the difference between study and control groups in terms of serum 25-hydroxy (OH) vitamin D levels was also evaluated.

Results: It was determined that the levels of vitamin D were within normal (10–90 ng/mL) limits in both groups. It was found out that the mean serum 25(OH)vitamin D level (15.39 ng/mL) of the study group was significantly lower than the control group (53.80 ng/mL) ($p=0.00$). No significant difference was found between the genders in terms of vitamin D levels ($p=0.398$).

Conclusion: It is necessary to do more researches on the effects of vitamin D derivatives on allergic rhinitis. This study indicates that a vitamin D deficiency should be taken into consideration during the treatment for resistant allergic rhinitis patients.

Keywords: Allergic rhinitis, 25-hydroxyvitamin D, allergic diseases.

Özet: Alerjik rinit ile 25-hidroksivitamin D serum seviyelerinin ilişkisinin değerlendirilmesi

Amaç: Son yıllarda alerjik hastalıklarla, D vitamini eksikliği arasındaki ilişkiye dikkat çeken çalışmalar bulunmaktadır. Bu ilişki D vitamini türevlerinin immünmodülatör etkilerine bağlanmıştır. Ancak alerjik rinit ile D vitamini türevlerinin ilişkisine dair sınırlı sayıda çalışma bulunmaktadır. Bu konuya ışık tutabilmek amacıyla çalışmamızı planladık.

Yöntem: Çalışma grubu ARIA (*Allergic Rhinitis and its Impact on Asthma*) kriterlerine göre alerjik rinit tanısı konulan 30 hastadan oluşturulmuştur. Kontrol grubuna ise aynı yaş ve cinsiyetlerde alerjik rinit hastalığı bulunmayan 30 hasta dahil edilmiştir. Altta yatan kalsiyum ve D vitamini eksikliği yapabilecek hastalığı bulunan hastalar çalışma dışında bırakılmıştır. Serum 25-hidroksi (OH) vitamin D düzeyleri açısından çalışma ve kontrol grupları arasında anlamlı fark olup olmadığı değerlendirilmiştir.

Bulgular: Her iki grupta D vitamini seviyelerinin normal (10–90 ng/mL) sınırlarda olduğu saptanmıştır. Çalışma grubunun ortalama serum 25(OH)vitamin D düzeyinin (15.39 ng/mL) kontrol grubuna (53.80 ng/mL) göre anlamlı olarak ($p=0.00$) düşük olduğu saptanmıştır. D vitamini düzeyleri açısından cinsiyetler arasında anlamlı farklılık saptanmamıştır ($p=0.398$).

Sonuç: D vitamini türevlerinin alerjik rinit üzerindeki etkilerine dair daha fazla çalışma yapılması gerekmektedir. Bu çalışma özellikle tedaviye dirençli alerjik rinit hastalarında D vitamini eksikliğinin de göz önünde bulundurulması gerektiğine dikkat çekmektedir.

Anahtar sözcükler: Alerjik rinit, 25-hidroksivitamin D, alerjik hastalıklar.

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Received: September 5, 2014; **Accepted:** December 20, 2014

Online available at:
www.entupdates.org
doi:10.2399/jmu.2015001005
QR code:



Allergic rhinitis is a health problem commonly seen in the society. It is an immune system derived reaction developing as a result of exposure to allergen.^[1] In USA, 17–25% of the population is diagnosed with allergic rhinitis. The prevalence varies regionally due to geographical factors and diversity of the allergens.^[2]

It is known that there is a relationship between allergic diseases and weakness of immune system.^[3] The recent studies show that there is a correlation between allergic disease and vitamin D levels.^[4] It is also known that vitamin D is effective in immune-modulation; however, its relationship with allergic rhinitis is a controversial subject.^[5] According to a certain theory, the increase of indoor jobs in recent years resulted in a decreased exposure to the sun, and therefore in an increase of allergic diseases due to decreasing cutaneous production of vitamin D.^[6]

Allergic rhinitis is an important disease since it is a common problem, affects quality of life fairly negatively and its prevalence increases continuously. The present study was planned as there are a limited number of studies on the relationship between allergic rhinitis and vitamin D and their conclusions are controversial.

Materials and Methods

The study protocol was approved by ethics committee of Medical Faculty of Ankara Ufuk University.

The study included 60 patients aged between 15 and 55. The study group was composed of 30 patients diagnosed with allergic rhinitis according to ARIA (Allergic Rhinitis and its Impact on Asthma) criteria. The control group was composed of the patients in the same age and gender without allergic rhinitis. The patients with an underlying disease which may cause calcium and vitamin D metabolism disorder were excluded. Therefore, the patients with osteoporosis, osteomalasia, sarcoidosis, celiac disease, Crohn's disease, ulcerative colitis, rickets, thyroid dysfunction, multiple sclerosis and rheumatoid arthritis were not included in the study. Serum 25(OH)vitamin D levels were measured in all patients and the difference between study and control groups was investigated. Informed consent forms were received from all patients.

Results

A total of 60 patients (44 female and 16 male), 30 patients in the study group and 30 patients in the control group, were evaluated in terms of age, gender and serum 25(OH)vitamin D levels. Normal distribution analysis was performed with

one-sample Kolmogorov-Smirnov test. The difference between groups was evaluated with Mann-Whitney U test. The mean serum 25(OH)vitamin D level of the study group was determined as 15.39 ± 4.57 ng/mL and as 53.80 ± 12.25 ng/mL in the control group. The level of serum vitamin D was within normal limits in both groups (10–90 ng/mL). The level of vitamin D in the study group was significantly lower than in the control group ($p=0.000$). While the mean of vitamin D in females was 35.48 ± 22.69 ng/mL ($n=44$), it was 41.04 ± 26.92 ng/mL ($n=16$) in males. No significant difference was found between the genders in terms of vitamin D levels ($p=0.398$).

Discussion

Allergic rhinitis starts with the development of sensitization in the body against the allergen. When the allergen particles encounter with respiratory mucosa or skin, they are handled with Langerhans cells and antigen server cells and carried to local lymph nodes. The antigen is served to non-differentiating Th0 cells. In atopic individuals, this allergen triggers conversion of Th0 cell to Th2 cell. Sensitization starts with stimulation of IgE production by the cytokines released from Th2. An allergic reaction is triggered when an allergen is bound to the specific IgEs on the surface of mast cell. The mediators released from mast cells lead to vasodilatation, an increase of vascular permeability and an increase of secretion, and finally an inflammatory reaction occurs.^[7,8]

The basic biologic effects of vitamin D are associated with calcium homeostasis and bone metabolism. However, vitamin D does also have indirect impacts on immune-modulation.^[9] It was notified that the derivatives of vitamin D modulate IL-2, IL-4 and IL-5 cytokines. Additionally, they are also known to have a role of inhibiting Th-2 response.^[10] Hyppönen et al. showed that both low and high vitamin D levels increase Ig E level in healthy individuals. They also found that regulation of serum vitamin D level decreases the high Ig E level.^[11] Furthermore it is also considered that the effects of vitamin D on calcium metabolism play a role in immune-modulation.^[12] Again, anti-inflammatory and anti-edema effects of vitamin D derivatives were also proven.^[13]

Although there are many studies taking attention to the correlation between deficiency of vitamin D and asthma in the literature, there are limited studies which examine its relationship with allergic rhinitis. In a study examining the relationship between allergic rhinitis and a deficiency of vitamin D, it was found out that the patients

with allergic rhinitis had a mild deficiency of vitamin D compared to the normal population ($p=0.03$).^[14] Bonanno et al. also examined the relationship between 25(OH)vitamin D and IL-31/IL-33 Th2 serum levels in a study performed on children diagnosed with allergic rhinitis or allergic asthma. They concluded that 25(OH)vitamin D level was significantly lower in allergic rhinitis and asthma; however, it was independent from IL 31/IL-33 Th2 activity.^[15] San et al. reported that 1,25(OH)₂D₃ serum level was lower than the control group in the children with allergic rhinitis. They also determined that the symptoms and findings of allergic rhinitis were higher in the group with higher grass pollen allergy specific Ig Es. They concluded that the children with grass pollen allergy receive less sunlight as they rarely go out, therefore a decrease in the level of vitamin D would be expected.^[16] In our study, we determined serum 25(OH)vitamin D level as 15.39 ng/mL in the patients with allergic rhinitis and as 53.80 ng/mL in the control group. We found that the level of vitamin D was within normal limits in both groups (10–90 ng/mL); however, it was significantly lower in the study group than the control group ($p=0.00$).

Effectiveness of vitamin D treatment in allergic rhinitis is still unknown. Back et al. investigated the relationship between use of vitamin D in the first year of life and atopic allergy. In their prospective study performed by observing 123 newborns until 6 years, they evaluated the prevalence of atopic dermatitis, allergic rhinitis and asthma. They found that the children given a high dose of vitamin D treatment during infancy (13.2–25.1 ng/mL) had significantly more allergic diseases than those with a low dose of vitamin D (0.6–13.0 ng/mL). They concluded that the dose of vitamin D used during infancy should be modified.^[17] In another study, it was reported that the support of vitamin D during infancy increases the rate of allergic rhinitis and atopy during adulthood.^[18]

The studies show that the prevalence of vitamin D deficiency is higher in women. Arshi et al. carried out a study in Iran to examine the relationship between allergic rhinitis and serum D vitamin levels. According to the results of that study vitamin D deficiency was significantly higher in women than men ($p=0.00$).^[19] In allergic rhinitis patients included in our study, the prevalence of women ($n=16$) was higher than men ($n=4$). However, no significant difference was found between both genders in terms of vitamin D serum levels.

As a conclusion, the importance of vitamin D deficiency has been increasing in recent years for diagnosis and treat-

ment of many diseases. Its role in immune-modulation by means of various mechanisms focuses on its relationship with allergic diseases. More researches are needed to analyze the relationship between allergic rhinitis and vitamin D levels.

Conflict of Interest: No conflicts declared.

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Please cite this article as: Yalçinkaya E, Tunçkaşık ME, Güler İ, Kocatürk S, Gündüz Ö. Evaluation of the correlation of 25-hydroxyvitamin-D serum levels with allergic rhinitis. *ENT Updates* 2015;5(1):19–22.