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Association of Vitamin D and Allergic Disorders in Children

Gururaja R[1]

[1]Assistant Professor, Department of Paediatrics, Command Hospital, Lucknow, Uttar Pradesh, India.

Abstract

Background: To assess association of vitamin D and allergic disorders in children.**Material and Methods:**Eighty- four children with history of asthma and atopic dermatitis of either gender was selected. Patients were put in group I and healthy subjects (control) in group II. The severity of atopic dermatitis was evaluated using the Scoring Atopic Dermatitis Scale (SCORAD). Blood vitamin D level (ng/mL) was assessed using chemiluminescence phenomenon (CLIA).**Results:**Group I had 40 males and 44 females and group II had 42 males and 42 females. The mean vitamin D level in group I patients was 25.3 ng/ml and in group II was 33.8 ng/ml. A significant difference was observed in both groups (P< 0.05). Vitamin D level >20 ng/ml was seen in 26 subjects in group I and 54 in group II and vitamin D level <20 ng/ml in 58 in group I and 30 in group II. A significant difference was observed in both groups (P< 0.05). A non- significant difference was seen depicting non- association of concentration of total IgE antibodies, number of eosinophils and vitamin D (P> 0.05).**Conclusion:**There was higher concentration of total IgE antibodies and the number of eosinophils in patients with vitamin D deficiency.

Keywords: Atopic Dermatitis, Allergic Disorders, Vitamin D.

Corresponding Author: Dr.Gururaja R, Assistant Professor, Department of Paediatrics, Command Hospital, Lucknow, Uttar Pradesh, India.

Introduction

A fat-soluble vitamin called vitamin D is necessary for our bodies to function properly. It is essential for several functions, such as calcium and phosphorus absorption, bone health promotion, immune system support, and cell development and differentiation regulation.[1]

Vitamin D has several important roles in the human beings. It helps in calcium and phosphorus absorption from the intestines. This is crucial for maintaining healthy bones and teeth. Without adequate vitamin D, the body may struggle to absorb enough calcium, resulting in weakening of bones and enhanced chances of fractures.[2]It has immune-modulating effects, meaning it helps regulate the immune system's response. The function of T cells and macrophages are increased and helps protect against infections. Inadequate vitamin D levels leads to increased risk of respiratory infections, autoimmune diseases, and certain cancers.[3]

Emerging data proposes a probable connection among food allergies and vitamin D, particularly in younger adults.[4] According to some research, infants who don't get enough vitamin D may be more likely to grow up to have food allergies. By lowering the production of proinflammatory cytokines including IL-2, INF-gamma, TNF-alpha, and others, vitamin D has been demonstrated to suppress Th1 cells.[5,6] On the other hand, it is still unknown how vitamin D affects the Th2 lymphocyte system. Though, few researches have demonstrated that it can do so by upregulating the expression of the cytokines IL-4, IL-5, and IL-13 to cause a Th2-mediated inflammatory response.7,8 The present study assessed association of Vitamin D and allergic disorders in children.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

Methodology

The present study comprised of eighty- four children with history of asthma and atopic dermatitis of either gender. Institutional ethical &review committee approved the study. A written parental consent was also sorted obtained before commencing the study. On the basis of Global Initiative for Asthma (GINA), the diagnosis of asthma was established.

Baseline demographic characteristics were recorded in case sheet. We put all patients in group I and healthy subjects (control) in group II. Scoring Atopic Dermatitis Scale (SCORAD) determined severity of atopic dermatitis. Score 0 depicts absence of atopic changes or any other symptoms in children. On the basis of scoring calculated, all enrolled subjects were classified into 3 groups with SCORAD < 20 (mild atopic dermatitis), SCORAD 20–40 (moderate atopic dermatitis) and SCORAD > 40 (severe atopic dermatitis). Blood vitamin D level (ng/mL) was assessed using chemiluminescence phenomenon (CLIA). The data obtained during the study was entered in MS excel sheet and statistical analysis was performed using chi- square test where p value < 0.05 was regarded significant.

RESULTS

Group I had 40 males and 44 females and group II had 42 males and 42 females [Table 1].

Table 1:Patients distribution

Group	Group I	Group II
Male: Female	40:44	42:42

Table 2: Assessment of vitamin D level in both groups

Groups	Mean (Vitamin D) (ng/ml)	P value
Group I	25.3	0.02
Group II	33.8	

The mean vitamin D level in group I patients was 25.3 ng/ml and in group II was 33.8 ng/ml. A significant difference was observed in both groups (P< 0.05) [Table 2, Figure 1].

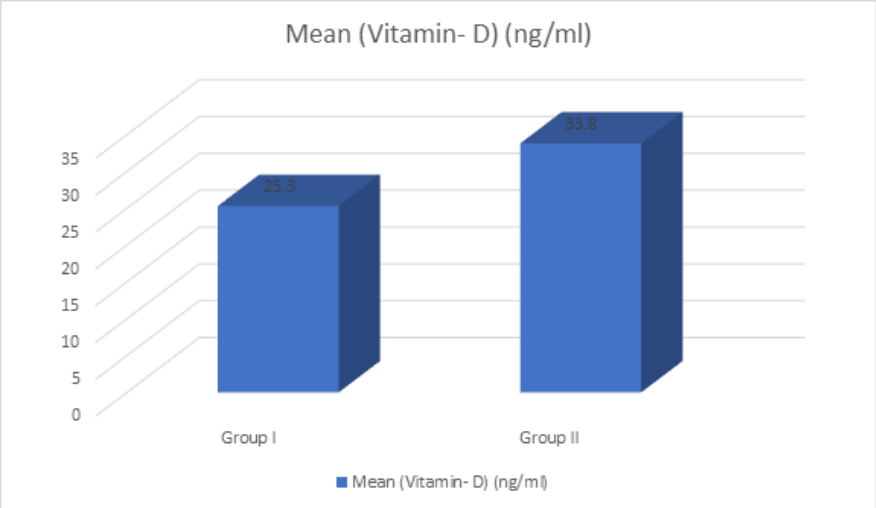

Figure 1: Assessment of vitamin D level in both groups

Table 3: Number of vitamin D deficiency cases in both groups

Vitamin D level	Group I	Group II	P value
>20 ng/ml	26	54	0.02
< 20 ng/ml	58	30	0.04

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 06, 2023

Vitamin D level >20 ng/ml was seen in 26 subjects in group I and 54 in group II and vitamin D level <20 ng/ml in 58 in group I and 30 in group II. A significant difference was observed in both groups (P< 0.05) [Table 3].

Table 4: Effect of vitamin D on the concentration of IgE total and eosinophils

Parameters	Vitamin D (>20 ng/ml)	Vitamin D (<20 ng/ml)	P value
IgE total [IU/mL]	312.5	274.5	0.82
Eosinophil [×103/uL]	0.57	0.43	0.75
Eosinophil [%]	7.9	5.3	0.36

A non- significant difference was seen depicting non- association of concentration of total IgE antibodies, number of eosinophils and vitamin D (P> 0.05) [Table 4].

DISCUSSION

Vitamin D insufficiency is one of the most undiagnosed conditions worldwide. This is primarily because of the alteration in human lifestyle.[9] The modern way of life is generally characterised by long workdays spent indoors, which limits exposure to sun radiation, which is important for the skin's natural production of vitamin D. Another reason for this insufficiency is that modern eating patterns have changed from those of a half-century ago.[10] According to literature a possible connection among an increased risk of asthma development and exacerbations and low vitamin D levels have been identified. Vitamin D has potential role in regulating the immune response and reducing airway inflammation, which are key factors in asthma.[11]Based on this, the present assessed association of vitamin D and allergic disorders in children.

Group I had 40 males and 44 females and group II had 42 males and 42 females. In a study by Kim et al,[12] when compared to healthy children, children with atopic dermatitis showed lower 25(OH)D levels. In this investigation, the advantages of vitamin D supplementation were also evaluated. According to SCORAD or EASI scales, children who got vitamin D showed less severe illness progression.

In our study, the mean vitamin D level in group I patients was 25.3 ng/ml and in group II was 33.8 ng/ml. Peroni and colleagues,[13] have observed a relationship between the serum vitamin D concentration of children with atopic dermatitis and the progression of allergic disorders. A significantly lower 25(OH)D concentrations has been found in patients with mild and severe course of the disease as compared to healthy individuals.

Our results showed that vitamin D level >20 ng/ml was seen in 26 subjects in group I and 54 in group II and vitamin D level <20 ng/ml in 58 in group I and 30 in group II. A non-significant difference was seen depicting non- association of concentration of total IgE antibodies, number of eosinophils and vitamin D (P> 0.05). Sharma et al,[14]in their study among 40 patients, an inverse correlation between the concentration of vitamin D in the blood serum and the SCORAD index was observed. Saad et al,[15]in their study on 120 children with allergic rhinitis (AR) and 100 unaffected subjects, relationships between vitamin D status and the severity of the condition were determined. The results revealed that children in the AR group had significantly lower serum levels of calcium, 25(OH)D, and 1,25(OH)2D as compared to controls (p- .0001, p- .001, and p- .0001, respectively). It was further found that subjects with mild AR exhibited higher 25-OHD3 levels in contrast to subjects with moderate to severe AR (p-.001). In the AR group, we discovered significant negative associations between mean 25(OH)D levels, total immunoglobulin E levels, and total nasal symptom score (r = -0.62, p =.002) and levels (r = -0.27, p =.013).

In 164 patients, Lee et colleagues evaluated the connection between serum vitamin D levels and allergic/vasomotor rhinitis (AR/VR).[16] There were 63 controls, 42 patients with VR, and 59 patients with AR age ranged 0- 16 years. The AR group's serum 25-hydroxyvitamin D levels were 19.0 8.5 ng/mL, the VR group's were 25.5 10.9 ng/mL, and the control group's

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were 26.9 10.7 ng/mL. Vitamin D levels in VR group was more in comparison to the AR group and control group (P=0.003 and P=0.001, respectively). Immunoglobulin E levels and vitamin D levels had a negative correlation (r=-0.317, P= 0.001). Compared to AR patients without these conditions, patients with food allergies or atopic dermatitis did not have reduced levels of 25-hydroxyvitamin D. According to research by Jung et al,[17] vitamin D deficiency and the prevalence of AR in Korean people may be related.

Lipińska- Opałka et al,[18] when compared to the control group, discovered that children with allergic diseases were considerably more likely to have vitamin D deficiency. It was also obtained in the study that when compared to children with a severe clinical course of the condition, children with a moderate course of the disease had statistically significantly higher blood levels of vitamin D level. A lower percentage of NKT cells and T-regulatory lymphocytes were seen in the vitamin D-deficient group of children in comparison to the vitamin D-sufficient group.

Cairncross et al,[19] in their research observed that the mean 25(OH)D concentration was 52 nmol/L. It was below 25 nmol/L in 7% of children and levels >50 nmol/L in 49% children. It was also seen that in children with 25(OH)D concentrations 75 nmol/L (n = 29) compared to children with concentrations between 50 and 74.9 nmol/L had higher chances of food allergy. There was no correlation among eczema, allergic rhino conjunctivitis, or atopic asthma and 25(OH)D concentration. Several allergic disorders were not linked to vitamin D deficiency in these pre-schoolers High levels of 25(OH)D, however, were linked to a two-fold increased incidence of food allergy.

CONCLUSION

There was higher concentration of total IgE antibodies and the number of eosinophils in patients with vitamin D deficiency.

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