

Vitamin D3 in children with allergic asthma in clinical practice

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Abstract

Asthma is a chronic inflammatory disorder; type 2 inflammation is the most common asthma endotype in childhood. T regulatory cells are functionally and allergen-specifically defective in allergic patients. Vitamin D3 exerts many functions on immune system, mainly concerning T regulatory function. Asthma control is the goal of the asthma treatment. We aimed to stratified a group of 76 consecutive children (50 males, 26 females, mean age 10.4 ± 2.2 years) with allergic asthma and visited for the first time at a third-level paediatric clinic during a 3-month period, considering the Vitamin D3 serum levels. The three Vitamin D3 classes were not able to discriminate significant difference for all the parameters considered. In conclusion, Vitamin D3 serum assessment seems to be scarcely useful to pheno/endotyping allergic asthmatic children in clinical practice.

KEYWORDS

asthma, asthma control, clinical practice, Vitamin D3

Asthma is a chronic inflammatory disorder; type 2 inflammation is the most common asthma endotype in childhood. Type 2 inflammation is characterized by a polarized T helper 2-mediated immune response to allergens and by a specular deficiency of type 1 immune response. T regulatory cells are functionally and allergen-specifically defective in allergic patients.

Vitamin D3 exerts many functions on immune system, mainly concerning T regulatory function,¹ therefore vitamin D3 could play a relevant role in the control of the response to allergens, both in normal subjects and in allergic patients. However, the real association between asthma and Vitamin D3 has to be considered multifactorial and subordinated to multifaceted reciprocal influences. There is evidence that Vitamin D3 supplementation could improve asthma control and prevent exacerbations in children, but there are also reports showing conflicting outcomes.¹ Therefore, supplementation should not be indiscriminate, but there is the need to well characterize the pathophysiological mechanisms involved in every subject.

Han and colleagues performed a cross-sectional study in 1821 children,² and reported that there was a significant interaction between vitamin D insufficiency and polycyclic aromatic hydrocarbons (PAH) metabolites on lung function in asthmatic children. Therefore, they concluded that vitamin D insufficiency and PAH exposure may have synergistic and detrimental effects on lung function.

Moreover, in clinical practice, asthma control assessment is crucial as well as pheno/endotyping patients to tailor the best appropriate treatment.³ These two issues deserve carefully attention in clinical practice as uncontrolled asthma is a main risk factor for asthma exacerbations.⁴ Therefore, asthma control is actually the goal of asthma management. However, a good asthma control is achieved by a small number of patients. Several factors may be responsible, including presence of comorbidities, inadequate assessment, insufficient compliance and adherence, socio-economic and cultural disadvantage, and emotional problems.

In this regard, we would like to implement the discussion about this interesting issue reporting our practical experience. We aimed to stratified a group of 76 consecutive children (50 males, 26 females, mean age 10.4 ± 2.2 years) with allergic asthma and visited for the first time at a third-level paediatric clinic during a 3-month period, considering the Vitamin D3 serum levels. The procedure was approved by the Ethics Committee and parents signed an informed consent. Asthma diagnosis was performed according GINA document.⁵ The evaluated parameters included: age, gender, BMI and z-score BMI, lung function, FeNO, ACT questionnaire, asthma and depression questionnaire (HADS), VAS of breathing perception, peripheral eosinophils, total serum IgE, serum periostin, daily inhaled CS dose, control asthma grade and asthma severity (according to GINA document). The children

TABLE 1 Comparisons among asthmatic patients stratified by different Vitamin D levels

	Normal >75 nmol/L (N:14, 18.4%)	Insufficiency 25-75 nmol/L (N:54, 71.1%)	Deficiency <25 nmol/L (N:8, 10.5%)	P-value
Age [yrs, mean (SD)]	10.29 (2.34)	10.22 (2.35)	10.75 (1.98)	0.83
Male gender [N (%)]	10 (71.43%)	33 (61.11%)	7 (87.5%)	0.30
BMI [kg/m ² , mean (SD)]	20.33 (3.68)	19.5 (4.18)	19.48 (3.66)	0.79
BMI [percentile, mean (SD)]	71.93 (24.06)	65.63 (29.22)	67.88 (27.90)	0.76
z-score BMI [score, mean (SD)]	0.75 (0.87)	0.56 (1.00)	0.58 (0.90)	0.8
FVC [% pred, mean (SD)]	97.79 (13.79)	105 (12.95)	109.4 (13)	0.10
FEV ₁ [% pred, mean (SD)]	90.79 (18.13)	96.24 (11.78)	98.63 (12.26)	0.31
FVC/FEV ₁ [% pred, mean (SD)]	89.86 (11.77)	89.43 (7.68)	87.88 (4.39)	0.86
FEF ₂₅₋₇₅ [% pred, mean (SD)]	80.14 (31.19)	81.15 (19.39)	80.25 (16.03)	0.98
FeNO [ppb, median (LQ-UQ)]	38.5 (21-50)	32 (22-49)	23.5 (17-35.5)	0.26
ACT [score, mean (SD)]	19.43 (3.28)	20.19 (3.57)	19.13 (6.27)	0.67
TSS [score, median (LQ-UQ)]	4.57 (4.22)	4.78 (3.56)	3.5 (3.34)	0.66
VAS (Breathing) [cm, mean (SD)]	3.71 (2.30)	4.94 (3.38)	3.13 (3.48)	0.2
Blood eosinophil count [cells/mm ³ , median (LQ-UQ)]	450 (250-600)	400 (200-700)	300 (250-900)	0.99
Total serum IgE [kU/L, median (LQ-UQ)]	334 (26.6-601.5)	291 (123.5-641)	445.5 (305.5-863.5)	0.40
HADS-A [score, median (LQ-UQ)]	6.5 (4.5-12)	9 (4-11)	9.5 (4-10)	0.77
HADS-A (abnormal) [N (%)]	6 (42.86%)	28 (51.85%)	5 (62.5%)	0.67
HADS-D [score, median (LQ-UQ)]	5 (3-6)	5 (3-6)	5.5 (4-7)	0.54
HADS-D (abnormal) [N (%)]	2 (14.29%)	8 (14.81%)	1 (12.5%)	0.98
Asthma control (GINA) [N (%)]				
Not controlled	5 (35.71%)	12 (22.22%)	2 (25%)	0.8
Poor controlled	6 (42.86%)	22 (40.74%)	3 (37.5%)	
Well-controlled	3 (21.43%)	20 (37.04%)	3 (37.5%)	
Dose of inhaled CS [mcg, mean (SD)]	728.6 (292)	585.9 (273)	587.5 (274.8)	0.23
Asthma severity [N (%)]				
Mild	0 (0%)	4 (7.41%)	0 (0%)	0.49
Moderate	3 (21.43%)	19 (35.19%)	2 (25%)	
Severe	11 (78.57%)	31 (57.41%)	6 (75%)	

were stratified in three subgroups according to the Vitamin D serum levels: normal, insufficient, and deficient.

Only 18 children (18%) had normal Vitamin D3 status, but Vitamin D3 was not associated with any asthma control grade. Notably, the three Vitamin D3 classes were not able to discriminate significant difference for all the parameters considered, as reported analytically in Table 1.

This finding confirms the controversial role of Vitamin D3 as potential biomarker in asthmatic children and underlines the importance of carefully pondering the decision of prescribing Vitamin D3 supplementation as it cannot be an indiscriminate option.

The current study has some limitations, including the cross-sectional study design and the limited number of enrolled children. However, it was conducted in a real-world setting, so mirroring the reality observable in the daily clinical practice.

In conclusion, Vitamin D3 serum assessment seems to be scarcely useful to pheno/endotyping allergic asthmatic children in clinical practice.

CONFLICT OF INTEREST

The authors declare no conflict of interests

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