

# The effect of serum Vitamin D level on asthma severity in children admitted to Al Diwaniyah maternity and children teaching Hospital

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## Abstract

**Backdrop:** recent reseaches reported that vitamin D inadequacy and paucity are widespread throughout the world and related to large number of illnesses encompassing asthma.

**Objective of study:** to assess vitamin D inadequacy and paucity in children with asthma in Al Diwaniyah maternity and children teaching Hospital and their relations to the disease severity .

**Methods:** This case-control study was carried out on 173 child, 87 had asthma and 86 normal children as control group, aged 2 to 5 years in Al Diwaniyah maternity and children teaching Hospital, Iraq, during the period from the 17th of September to 3rd of November 2014. Patients with asthma were subdivided into 4 categories according to severity: intermittent, mild persistent, moderate persistent, severe persistent. The level of vitamin D was measured and equated between the study groups.

**Results:** The discrepancy of vitamin D values in the asthma group (mean +/- SD)  $37.5 \pm 7.43$  ng/mL) and the well group (mean +/- SD)  $173.88 \pm 17.79$  ng/mL) was encountered to be highly important ( $P < 0.001$ ). Mean serum vitamin D showed marked decrease as the disease severity increase. An important disparity was conformed between the study groups concerning the commonness of pulmonary infections causing visits to the emergency rooms admissions and number of hospital admissions ( $p < 0.001$ ).

**Conclusion:** these results showed that serum 25-hydroxy vitamin D levels were inversely related to asthma severity.

## Introduction

Vitamin D is a fat soluble vitamin. recently, research had encountered that vitamin D might play a role in many chronic diseases such as cancer, autoimmune diseases, infections, and cardiovascular disorders. Vitamin D may also had a role in many diseases involving the respiratory system. (1,2, 3) There are not many food and drinks origins of vitamin D. Fish liver oils have a lofty vitamin D content. Other good

dietary origins enclose fish and egg yolks. The majority of children in the developed regions take vitamin D by enriched foods, particularly a milk substitute and milk (both of which contain 400 IU/L) and certain morning meal cereals and breads. The milk of breast has a substandard vitamin D content, near 12-60 IU/L (4,5,6). Drugs might interfere with the absorption or metabolism of vitamin D include: Agents that neutralize stomach acidity

received for long durations may modify the values, assimilation, and obtainability of vitamin D. Cholestyramine (cholesterol-reducing drugs) known as a bile acid binder, interposes with bowel absorption of vitamin D. Phenobarbital, phenytoin, and other antiseizure remedies, these drugs may increase the core's usage of vitamin D. (7,8).

Asthma is a persistent inflammatory condition of the lung airpassages causing recurrent airflow obstruction. (9) An admixture of climatic and inheritable agents in life beginning fit how the immune system evolves and reacts to ubiquitous climatic exposures. Respiratory microorganisms, inhaled allergens, and pollens that can damage the lower airways target the disease process to the lungs (10). Vitamin D helps in lung development and airway inflammation in early transient wheezers, where as in recurrent wheezers it provides anti-viral immunity and reduces the attack of wheeze. Lower level are combined with increase markers of allergy and asthma severity. Insufficient level are associated with risk of severe exacerbation especially when not on inhaled corticosteroid. (11) Deficient level of vitamin D is related to augmented airway excessive responsiveness, lesser respiratory functions, bad control of asthma. Lung epithelial cell show lofty commencement values of  $\alpha$ -hydroxylase, this permits the transformation of inert calcitriol to functioning form inside the lung. Active Calcitriol had been exhibited to suppress the production and let go of some cytokines such as growth factor (platelet-derived), and metalloproteinases from smooth muscle cells of the bronchial tree, there by causing a reduction of lung inflammation and acceleration of smooth muscle cell. Vitamin D also enhances production of interleukin10 by CD4+CD25+FOXP3+ T holding cells

and dendritic cells. (12) There are two general categories of asthma, intermittent asthma and persistent asthma, the latter being further subdivided into mild, moderate, and severe, this classification is based on symptoms severity, control and response to treatment.

The aim of this study is to assess vitamin D insufficiency and deficiency and its clinical effects in children with asthma in Al Diwanayah maternity and children teaching Hospital and their relation to the disease severity.

### Patients and Methods

A case-control study conducted in Maternity and children teaching hospital in Al-Diwaniyah Governorate, Republic of Iraq (180 km south of Baghdad) during the period from the 17th of September to 3rd of November 2014, the study involves 173 children aged 2-5 years (87 children were having asthma and 86 children were healthy as a control). The diagnosis of asthma was rested on the global initiative for asthma management and prevention (13). Patients taking vitamin D therapy following any disease, those on anti-epileptic therapy, those using extended steroid therapy in addition to asthma therapy were eliminated from the research, in addition to patients having continuing diseases aside from asthma, like lung disease, kidney diseases, hepatic diseases and diseases of the endocrine system. The data was collected from cases and controls by using a questionnaire form designed for the purpose of the study including socio-demographic characteristics, measurements such as height and weight, each child's Body Mass Index (BMI) was determined using the equation of  $\text{The weight/height}^2$  (14). The total of pulmonary tract illnesses accomplished in the past 6 months, the number of attendance to the emergency rooms and admissions to the hospitals and the frequency of asthma episodes

were also recorded. Patients with asthma were classified into 4 groups according to symptoms severity: intermittent, mild persistent, moderate persistent and severe persistent. The plasma value of vitamin D was measured by an equipment (electrochemiluminescence immunoassay on the Biotek ELx50auto analyser (Americans). When vitamin D serum level was less than (3.75 ng/ml), they were labeled as deficient. When vitamin D serum level was more than (6.25 ng/ml), subjects and patients were considered normal. Any level between the above mentioned levels was considered vitamin D insufficiency (15).

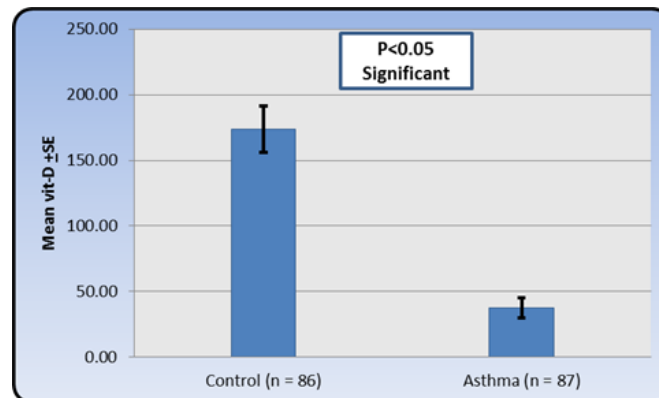
Statistical analysis was done by using SPSS (statistical package for

social sciences) version (16) computer software of Excel 2007. A P level of less than 0.05 was considered as statistically significant. The purpose of the study was explained to the study group (cases and controls). Their verbal consent for participation was obtained.

### Results

Mean vitamin D was importantly less in the ill children than in well children ( $P < 0.001$ ). Mean vitamin D in the patients was ( $37.5 \pm 7.43$ ), with a median of (5.5) and a range of (2-239). Mean vitamin D in control subjects was ( $173.88 \pm 17.79$ ), with a median of (109.15) and a range of (4.2-590) (figure 1).

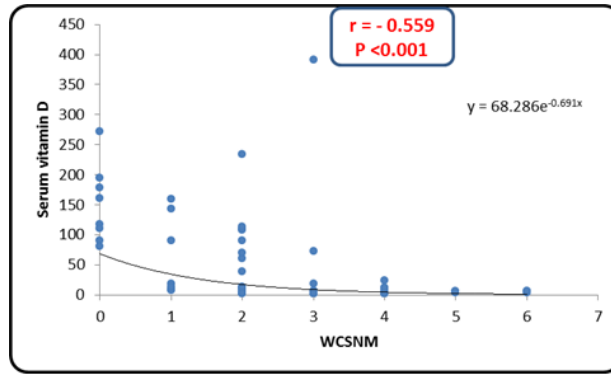
**Figure 1**



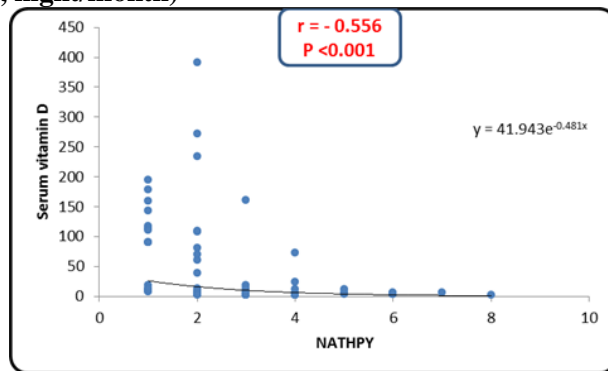
**The mean Vitamin D levels in the study groups**

There was a significant association between serum Vitamin D levels and both the frequency and severity of symptoms and frequency of hospitalization among patients with asthma (figure 2).

**Figure 2**



the frequency of symptoms and Serum Vitamin D levels(WCSNM:wheezing ,cough and shortness of breath, night/month)

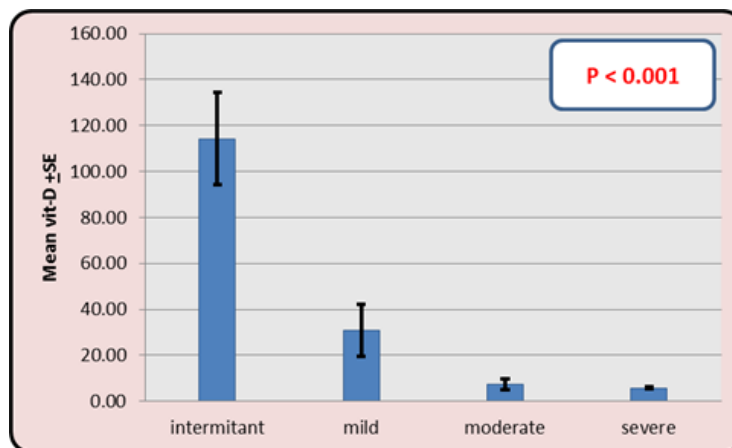


The number of hospitalization and Vitamin D levels in the patients group (NATHPY: number of admission to hospital per year)

Mean serum vitamin D showed marked decrease as the disease severity increase. Mean serum vitamin D was (114.29+20.8) in patients with intermittent asthma(16 patients). Mean serum vitamin D was (30.92+11.19) in patients with mild persistent disease( 39

patients). Mean serum vitamin D continued to decrease in patients with moderate persistent disease(29 patients) to be (7.26+2.43). It reached its lowest level in patients with severe persistent asthma( 3 patients) to be (5.83+0.52). These findings are outlined in figure (3).

Figure 3



The correlation between Vitamin D levels and asthma severity

## Discussion

In this research, vitamin D inadequacy and scantiness were encountered to be importantly more in children with asthma than in the well group, and these figures were comparable to figures mentioned in previous researches (16,17,18). While the figures encountered in a research from Iran were different (19). There was an important negative relation between serum vitamin D level and asthma disease severity (figure 3). These results are comparable with studies in children (20, 21, 22, 23) and adults (24) with asthma. The figure of hospital stays due to pulmonary problems augmented as serum vitamin D dropped in the asthma block. Certain studies (25, 26, 27, 28) had the same results as ours, others encountered lack of connection between vitamin D ranks and hospital admissions (29). Actually, vitamin D inadequacy had been displayed to make children susceptible to pulmonary infections and vitamin D intake was demonstrated to reduce the frequency of pulmonary infections (30, 31).

New researches exhibited that vitamin D inadequacy cause an amplification in the hazards of asthma episodes and augment asthma severity, sophisticating ruling of the illness (32).

In conclusion, the level of serum 25 OH D is lower in children with asthma in Diwaniyah than in the healthy children and the severity of asthma increases with decreasing levels of this vitamin. Early vitamin D supplementation to asthmatic children, improvement of their nutritional status together with exposure to sun light and a diet rich in vitamin D are logic recommendations of this study.

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