



EVALUATION OF VITAMIN D LEVEL AMONG PEDIATRIC AGE PATIENTS WITH BRONCHIAL ASTHMA

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ABSTRACT

Background: Asthma is a chronic lung immunological disease that causes reversible airway narrowing, inflammation, and hyperresponsiveness to triggers. It is a widespread chronic, noncommunicable condition affecting both children and adults. Vitamin D insufficiency is linked to exacerbations, poor control of symptoms and increased inflammatory response in pediatric asthma. **Objectives:** To assess the independent serum vitamin D levels in asthmatic children, as well as the link between vitamin D and asthma severity. **Methods:** This is a case-control study was carried out from August 2023 to December 2024 in the pediatric department at Talafar and Mosul General Hospital in Nineveh. Patients (2–14 years old) who had recurrent coughing, dyspnea, wheezing, and bronchodilator-reversible symptoms were recruited as asthma patients (cases). Compared with age- and gender-matched children who had never had asthma and attended the same setting (controls). The questionnaire included four parts, part one for socio-demographic information of the study participants, part two for the patient's clinical presentation and asthma severity, part three for Vitamin D level and triggers affecting Vitamin level. **Results:** The study includes 100 patients, 50 of them had asthma and considered the cases and matched with 50 patients never had asthma and considered as controls. The mean age of the study participants is 8.02 ± 1.39 years. It's evident that presence of positive family history of bronchial asthma within the cases is statistically significant difference than in controls (P value <0.001). Moreover; statistically significant difference is found between the cases and controls regarding their Vitamin D levels (P value <0.001). Furthermore; statistically significant difference between types of asthma regarding their Vitamin D levels. (P value <0.001). No statistically significant difference found between the level of asthma control, treatment that may affect Vitamin D and the presence of passive smoking with regard to Vitamin level (P value >0.05). **Conclusion:** Vitamin D deficiency and insufficiency are closely linked to childhood asthma, but it has no meaningful impact on illness severity or control. Children with asthma showed decreased serum vitamin-D levels compared to age- and gender-matched, healthy controls.

KEYWORDS: Severity, Family history, Talafar, Iraq.

1. INTRODUCTION

Asthma is a chronic lung immunological disease that causes reversible airway narrowing, inflammation, and hyperresponsiveness to triggers.^[1] It is a widespread chronic, noncommunicable condition affecting both children and adults.^[2-3] Airway inflammation can lead to bronchospasm, causing symptoms such as wheezing, dyspnea, chest tightness, and cough, especially at night or after exercise.^[4] Asthma presents differently in adults and children, making the elements that are specifically responsible for it unclear. In addition to that; compared to asthma in adults, pediatric asthma causes greater

hospital visits and financial burden, making it a serious concern.^[5] The asthmatic airway regulates the interleukins (IL)-4, IL-5, and IL-13, which are linked to elevated IgE levels and eosinophilia.^[5-7] Characterized by sporadic or ongoing coughing, dyspnea, and wheezing symptoms.^[8]

Airway remodeling is facilitated by the complex interaction between cells and inflammatory mediators as well as immunogenic tolerance impairment.^[9] This remodeling entails smooth muscle hypertrophy, epithelial goblet cell hyperplasia, and airway extracellular matrix

protein deposition, all of which may worsen obstruction of airflow and ultimately result in respiratory symptoms.^[10]

There are several dietary proposals related to asthma. Vitamin D levels are of special interest. Studies indicates a link between Vitamin D levels and asthma-related symptoms, perhaps due to its immune-modulating activities. Furthermore; Vitamin D insufficiency is linked to exacerbations, poor control of symptoms and increased inflammatory respond in pediatric asthma.^[11]

There are two categories of asthma risk factors: host factors and environmental factors. In childhood, asthma is more common in males than in females, and by adulthood, the prevalence is reversed due to host factors, genetics and weight.^[12-13] Allergens are one example of an environmental factor. Allergens type, dose, period of exposure, child age, genetics can affect the illnesses.^[14] Additionally; tobacco smoking, outdoor/indoor pollution, and food all contribute to the risk of having bronchial asthma.^[15]

The aim of study is to assess the independent serum vitamin D levels in asthmatic children, as well as the link between vitamin D and asthma severity.

2-PATIENTS AND METHODS

This is a case-control study was carried out from August 2023 to December 2024 in the pediatric department at Talafar and Mosul General Hospital in Nineveh. Patients (2–14 years old) who had recurrent coughing, dyspnea, wheezing, and bronchodilator-reversible symptoms were recruited as asthma patients. As a comparative control, age- and gender-matched children who had never had asthma and attended the same setting were purposefully chosen after taking the exclusion criteria into account. Two milliliters of blood were drawn following the selection of the case and control, and the Siemens Dimension EXL With LM was used to measure the

vitamin-D level. Parents were informed of the aim of the study, and their written agreement was obtained.

Demographic information such as age, gender, weight, residence of all children, maternal education level and occupation, as well as symptoms of asthma, past and family history of asthma, atopy, history of vitamin D supplementation, history of drug use that affects vitamin D levels, and characteristics of vitamin D deficiency disease, are included in a questionnaire. Cases were categorized into types of asthma based on the National guideline for management of asthma using clinical criteria. A comprehensive clinical examination was conducted in each patient, with a focus on identifying the clinical indicators of vitamin D insufficiency and asthma, such as rachitic rosary, frontal bossing, bow legs, and enlarged wrists.

Statistically analysis done by using SPSS 30.0 software application. Mean values were calculated for continuous variables. The quantitative observations were identified by frequency. The categorical variables were analyzed using the Chi-Square test with Yates correction, as indicated in cross tabulation. The student t-test was employed to compare continuous variables. A P value of <0.05 was considered as statistically significant.

3. RESULTS

The study includes 100 patients, 50 of them had asthma and considered the cases and matched with 50 patients never had asthma and considered as controls. The mean age of the study participants is 8.02 ± 1.39 years. It's evident that presence of positive family history of bronchial asthma within the cases is statistically significant difference than in controls (P value <0.001). On the other hand; no statistically significant difference between the cases and controls regarding age, gender, residence, maternal education level, maternal occupation and mean of weight. As shown in figure 3.1.

Table 3.1: Comparison between cases and controls regarding sociodemographic, anthropometric and family history information.

Variable	Case, number and percent	Controls, number and percent	P -Value
Age:			
-Less than 5 year	11 (22%)	10 (20%)	0.775
- 5-10 years	31 (62%)	33 (66%)	
- 10-14 years	8 (16%)	7 (14%)	
Gender:			
Male	40 (80%)	42 (84%)	0.821
Female	10 (20%)	8 (16%)	
Residency:			
- Urban	39 (78%)	40 (80%)	0.879
- Rural	11 (22%)	10 (20%)	
Maternal educational level:			
- Illiterate	12 (24%)	10 (20%)	0.811
- Primary	11 (22%)	13 (26%)	
- Secondary	13 (26%)	12 (24%)	
- University	11 (22%)	11 (22%)	

- Higher	3 (6%)	4 (8%)	
Maternal occupation			
Employed	9 (18%)	12 (24%)	0.158
House wife	41 (82%)	38 (76%)	
Weight (Kg), Mean \pm standard deviation	17.23 \pm 10.09	18.11 \pm 8.06	0.129
Presence of positive family history:	21 (42%)	7 (14%)	< 0.001

Table 3.2 shows comparison between cases and controls regarding their vitamin D levels. Statistically significant difference is found between them regarding this issue.

Table 3.2: Comparison between cases and controls regarding their Vitamin D levels.

Variable	Case, number and percent	Controls, number and percent	P -Value
Deficient (<10 ng/ml)	10 (20%)	2 (4%)	<0.001
Insufficient (10-30 ng/ml)	25 (50%)	19 (38%)	
Normal (30-100 ng/ml)	15 (30%)	29 (58%)	
Mean \pm Standard deviation	22.39 \pm 6.92	34.47 \pm 12.19	

Table 3.3 shows statistically significant difference between types of asthma regarding their Vitamin D levels.

Table 3.3: Comparison between types of asthma regarding their Vitamin D levels.

Types of asthma	Vitamin D (ng/ml)			P -Value
	Deficient = 10	Insufficient = 25	Normal = 15	
Intermittent	1 (2%)	3 (6%)	7 (14%)	<0.001
Mild persistent	3 (6%)	9 (18%)	5 (10%)	
Moderate persistent	3 (6%)	9 (18%)	2 (4%)	
Severe persistent	3 (6%)	4 (8%)	1 (2%)	

Table 3.4 explores comparison asthma characters and Vitamin D level. No statistically significant difference found between the level of asthma control, treatment that may affect Vitamin D and the presence of passive smoking with regard to Vitamin level (P value >0.05).

Table 3.4: Asthma characteristics and Vitamin D levels.

Variable	Vitamin D (ng/ml)			P -Value
	Deficient = 10	Insufficient = 25	Normal = 15	
Level of asthma control				
- Well controlled ^[28]	3 (10.7%)	13 (46.4%)	12 (42.8%)	0.632
- Partial controlled ^[22]	7 (31.8%)	12 (54.5%)	3 (13.6%)	
Treatment received				
- Montelukast ^[29]	6 (20.6%)	13 (44.8%)	10 (34.4%)	0.829
- Inhaled cortisone ^[21]	4 (19.0%)	12 (57.1%)	5 (23.8%)	
Passive smoking				
- Present ^[30]	6 (20%)	11 (36.7%)	13 (43.3%)	0.589
- Absent ^[20]	4 (20%)	14 (70%)	2 (10%)	

4. DISCUSSION

Vitamin D deficiency has been linked to chronic inflammatory disorders.^[16] In this study the mean age of patients with bronchial asthma was about 8 years which is matched as much as possible with same age controls patient without asthma. Moreover; the majority of the patients with asthma were males, which similar to the observation of Faruque Ahmad et al.^[17] On the other hand; in contrast to Faruque Ahmad et al most of the patients are reside in urban area, which might due to different study setting as a results different allergens exposure within urban and rural area, anyhow; a study conducted in Kerbala (Iraq) shown comparable findings.^[18]

Presence of positive family history of bronchial asthma was shown in this study to be significantly different (higher among the cases), as hereditary factor plays an important role in the complex heterogenous pathogenesis of bronchial asthma. Hussam M. Al-Alwany et al found comparable conclusion.^[19]

In the current study, patients with bronchial asthma found to had significantly lower levels of Vitamin D in comparison to those with no bronchial asthma. Which is consistent to previous research indicating that children with asthma have a greater prevalence of Vitamin D deficiency and insufficiency compared to controls.^[20] additionally; this study found that low Vitamin D concentrations in serum can lead to serious asthma,

which is goes with Zainab A.Razak Al-Sharifi et al study findings.^[21]

Vitamin D may have a direct impact on the airway due to its ability to improve steroid sensitivity and reduce inflammation through gene expression and cytokines.^[22] After an acute inhalational insult, a lack of vitamin D may result in an inability to turn off the inflammatory state, which is characterized by an increase in the activity of prostaglandin, leukotrienes, macrophages, T cell recruitment.^[23] Additionally, Vitamin D impacts collagen synthesis, prevents matrix metalloproteinase formation, and reduces fibroblast proliferation, indicating a role for 1, 25-dihydroxyvitamin D in tissue remodeling.^[24] However; due to small sample size, this study found that no statistically significant difference found between the level of asthma control, treatment that may affect Vitamin D and the presence of passive smoking with regard to Vitamin level. Comparable findings obtained from Nabaa Mohammed Jawad Al-Tuama et al.^[18]

Finally, the study's limitations include its retrospective case control methodology and somewhat small sample size. Furthermore, because of the short data collecting period, this study is vulnerable to selection and recall bias.

5. CONCLUSION

Vitamin D deficiency and insufficiency are closely linked to childhood asthma, but it has no meaningful impact on illness severity or control. Children with asthma showed decreased serum vitamin-D levels compared to age- and gender-matched, healthy controls.

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CONFLICT OF INTEREST

About this study, the authors disclose no conflicts of interest.

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