



CORRELATION OF LEVELS OF VITAMIN D WITH DISEASE CONTROL IN PATIENTS OF BRONCHIAL ASTHMA

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ABSTRACT Changing environmental factors like atmospheric pollution, dietary changes, decreased exposure to sunlight and allergens etc, associated with urban lifestyles may underlie the increased prevalence of Bronchial asthma. A growing body of literature has suggested a relationship between Vitamin D status and asthma related response symptoms presumably through the immunomodulatory effects of Vitamin D. The study was planned to investigate the prevalence of Vitamin D deficiency in adult patients with bronchial asthma and its potential relationship with asthma control. 200 patients of bronchial asthma formed the study group. Asthma control was assessed according to the criteria of Global Initiative for Asthma using a categorical scale to identify controlled partly controlled and uncontrolled asthma. Blood samples were estimated for Vitamin D by chemiluminescence on ADVIA CENTAUR XP. Patients were divided into 3 categories on the basis of levels of Vitamin D, deficient with levels < 20 ng/ml, insufficient with levels 20-30 ng/ml and sufficient with levels > 30 ng/ml. Data was expressed as Mean $\pm$ SD normally and students t test used for statistical significance. 50.3% of the subjects were found to have uncontrolled Bronchial asthma. Vitamin D deficiency was found to be common with 87% of the study population having Vitamin D values less than 20 ng/ml. Only 6.3% of the subjects of the study group had sufficient Vitamin D Levels. It was found that the levels of vitamin D were significantly lower in patients with uncontrolled and partly controlled asthma as compared to patients with controlled asthma ($p < 0.001$). The burden of Bronchial asthma is on the increase and challenge still remains to identify newer therapeutic interventions. In the present study significant low levels of vitamin D were found in patients of bronchial asthma which correlated significantly with disease control, suggesting that, Vitamin D may be further investigated for its therapeutic potential and used to decrease the morbidity and mortality in patients with bronchial asthma.

KEYWORDS : -bronchial asthma, vitamin D levels, disease control

INTRODUCTION

Bronchial asthma, one of the most prevalent disease affecting people worldwide, is a chronic respiratory disease characterized by heightened airway inflammation, airway hyper-responsiveness and airflow obstruction response to specific triggers. Changing environmental factors like atmospheric pollution, dietary changes, and allergens etc, associated with urban lifestyles may underlie the increased prevalence of this disorder. Among nutritional hypothesis, vitamin D status has gained interest since Vitamin D concentration also decreases with increased time spent indoors, decreased exposure to sunlight, less exercise and inadequate calcium intake. A growing body of literature has suggested that there is a relationship between Vitamin D status and asthma related response symptoms presumably through the immunomodulatory effects of Vitamin D. Cross sectional data indicate that low Vitamin D levels in patients with mild to moderate asthma correlates with poor asthma control and reduced lung function in children.

Despite the growing evidence of the role of Vitamin D in incidence of asthma and asthma exacerbation, studies are not at all consistent. Moreover, there is insufficient evidence to support a casual association between vitamin D status and asthma per se. There is also, paucity of data in adult asthma patients addressing the impact of vitamin D status on disease control and severity, more so from our part of the world.

Therefore, the study was planned to investigate the prevalence of Vitamin D deficiency in adult patients with asthma and its potential relationship with parameters of asthma severity and control.

MATERIALS & METHODS

The cross-sectional study was conducted in the Department of Biochemistry & Department of Pulmonary Medicine, Government

Medical College & Hospital, Chandigarh. The study received financial grant from DST Chandigarh. The study was approved by the Institutional Research and Ethics Committee.

The study group included 200 adult patients more than 18 yrs of age with bronchial asthma attending the OPD clinics of Dept of Pulmonary Medicine, calculated with a prevalence of 2.28% of asthma in Chandigarh 1. The subjects of the study group were included according to criteria criteria of the Global Initiative for Asthma. 2 Patients with any other lung disease or any severe systemic illness.

Detailed history and written informed consent was taken from all the participants of the study.

Asthma was diagnosed by spirometry. Pulmonary function tests were performed on all patients using standardized methods on SPIROLAB III. Forced expiratory flow rates were measured. Pulmonary function values were expressed as percentage of predicted value. Demonstration of reversibility of lung function ie, 12% reversibility in FEV1 after bronchodilator was used to confirm diagnosis of asthma. Asthma control was assessed according to the criteria of Global Initiative for Asthma using a categorical scale to identify controlled partly controlled and uncontrolled asthma 2.

Blood samples were obtained from the ante-cubital vein in the morning after overnight fast. The blood was centrifuged immediately and stored at -20°C until analysis. Estimation of Vitamin D was done by chemiluminescence on ADVIA CENTAUR XP.

Patients were divided into 3 categories on the basis of levels of Vitamin D according to previous recommendations 3. Patients with Vitamin D levels less than 20ng/ml were labelled as deficient, between 20-30

ng/ml as insufficient and with levels more than 30 ng/ml were considered as Vitamin D sufficient.

Data was expressed as Median and interquartile range Comparison of parameters between the groups was done by Kruskal Wallis test, with level of statistical significance set as $p < 0.05$.

RESULTS

The study group consisted of 200 patients of Bronchial Asthma. The mean age of patients in the study group was 46.6 ± 15.5 years. 50.3% of the subjects were found to have uncontrolled Bronchial asthma as per the criteria of Global Initiative for Asthma.

Vitamin D deficiency was found to be common with 87% of the study population having Vitamin D values less than 20 ng/ml. Only 6.5% of the subjects of the study group had sufficient Vitamin D Levels (Table 1).

It was found that the levels of vitamin D were significantly lower in patients with uncontrolled and partly controlled asthma as compared to patients with controlled asthma ($p < 0.0001$).

Table 1: Levels of Vitamin D & IgE in subjects of the Study Group

	Vitamin D Sufficient	Vitamin D Insufficient	Vitamin D Deficient
Percentage of subjects	6.5%	6.5%	87%
Median levels of Vitamin D	40.2 ng/ml	25.0 ng/ml	9.31 ng/ml
IQR	16.7	3.2	8.5

Table 2: Level of Asthma Control in patients of the study group.

	Levels of Asthma Control		
	Controlled	Partly controlled	Un-controlled
Percentage of subjects	20.4%	29.3%	50.3%
Median levels of Vitamin D	16 ng/ml	9.3 ng/ml	8.7 ng/ml
IQR	19.5	11.9	8.7

DISCUSSION

According to the Global Initiative for Asthma, bronchial asthma is a chronic inflammatory disorder that is related with hyper-responsiveness of the airway, which leads to repeated episodes of wheezing, dyspnoea, chest tightness and cough, particularly at night or early in the morning².

Asthma has become one of the most prevalent diseases worldwide causing a major public health concern. While there is evidence that the condition of asthma is multifactorial in etiology, changing environmental factors may underlie the rising prevalence of asthma, such as atmospheric pollution, dietary changes, and allergens, improvements in health and hygiene and lifestyle changes⁴. Among nutritional hypothesis, Vitamin D status is of particular interest regarding the controversial beneficial effects in non-skeletal disorders, like cardiovascular disease, cancer and asthma etc^{5,6,7}.

Vitamin D is a fat-soluble steroid hormone which is widely recognized as a modulator of calcium absorption and bone health⁸. Vitamin D also plays an important role in immune regulation through interaction with its receptors⁹. Currently, a growing body of literature supports an association between serum Vitamin D levels and respiratory infections attributable to the immune-modulatory properties of Vitamin D¹⁰. This interaction is important for individuals with asthma, as respiratory infections may influence the frequency, severity and duration of asthmatic symptoms.

Some studies have investigated the effect of Vitamin D on the inception and severity of asthma in adults. The findings of a cross-sectional study including Chinese patients with newly diagnosed asthma concluded that Vitamin D deficiency was highly prevalent and was associated with decreased lung function in this population¹¹. Also in asthmatic patients, reduced Vitamin D levels were associated with impaired lung functions, increased airway hyper-responsiveness and reduced glucocorticoid response suggesting that supplementation of Vitamin D levels in these patients might improve multiple parameters of asthma severity and treatment response¹². It has been demonstrated that there is a strong relationship between serum concentration Vitamin D, FEV1

and FVC¹³. However, Shaheen et al, did not confirm a positive association between blood Vitamin D concentration and adult lung function, reinforcing the inconsistency concerning the hypothesis of Vitamin D's beneficial effects¹⁴. A cross-sectional study in asthmatics and non-asthmatics, determining the correlation between Vitamin D levels and pneumococcal antibody levels, reported that active Vitamin D might enhance humoral immunity against streptococci pneumonia in subjects with atopic conditions, but not without atopic conditions¹⁵.

In the present study low levels of Vitamin D were found in patients of bronchial asthma. Majority of patients of the study group were vitamin D deficient. It was further found that vitamin D levels correlated with asthma control as significant low levels were found in patients with uncontrolled asthma as compared to patients with controlled form of the disease.

Similar results were found in another study, where a significant correlation was found between severity of asthma symptoms and Vitamin D deficiency.¹⁶ A study conducted on children with asthma also found significantly lower levels of vitamin D in comparison to healthy controls.¹⁷ Another recent study found that Vitamin D levels were significantly lower in patients with asthma as compared to healthy controls. They further found that the levels of Vitamin D decreased significantly in uncontrolled asthmatic patients than partially controlled and controlled patients.¹⁸ A study conducted by Korn et al in Germany, also concluded that low Vitamin D levels are associated with clinical parameters of asthma severity and control.¹⁹

CONCLUSION

Globally, bronchial asthma is a significant health issue. The disease's impact is rising, and finding novel therapeutic approaches is still a struggle. It has been proposed that there is an inverse relationship between the severity and control of bronchial asthma and levels of vitamin D. Despite living in an area with plenty of sunshine, our region's vitamin D deficiency rate has gone up due to cultural westernization and decreased time spent outside. According to the results of the present study, patients with bronchial asthma had significantly lower levels of vitamin D, which correlated significantly with disease control. This finding raises the possibility that vitamin D may have therapeutic value and be used to lower the morbidity and mortality rates of bronchial asthma patients.

REFERENCES:

- Aggarwal AN, Choudhary K, Chhabra SK et al. Prevalence and risk factors for bronchial asthma in Indian adults: a multicenter study. *Indian J Chest Dis allied Sci* 2006; 46(1):13-22.
- Guidelines: GINA Report GSeAmaP. Global Initiative for Asthma (GINA) 2012. <http://www.ginasthma.org/documents/4>.
- Holick MF, Binkley NC, Bischoff-Ferrari HA et al. Evaluation, treatment and prevention of Vitamin D deficiency: an Endocrine Society clinical practice guidelines. *J Clin Endocrinol Metab* 2011; 96:1911-1930.
- Huang H, Popodis K, Zarogoulidis P, et al. Drug design, development and therapy. 2013; 7:1003-1013.
- Toner CD, Davis CD, Milner JA. The vitamin D and cancer conundrum: aiming at a moving target. *J Am Diet Assoc* 2010; 110(10):1492-1500.
- Rosen CJ, Adams JS, Bikle DD, et al. The non-skeletal effects of vitamin D: an Endocrine society scientific statement. *Endocr Rev* 2012; 33(3):456-492.
- Ross AC, Manson JE, Abrams SA, et al. The 2011 report on dietary reference intakes for calcium and vitamin D from the Institute of Medicine: what clinicians need to know? *J Clin Endocrinol Metab* 2011; 96(1):53-58.
- Borradale D, Kimlin m. vitamin D health and disease: an insight into traditional functions and new roles for sunshine vitamin. *Nutr Res Rev* 2009; 22:118-136.
- LoPiccolo MC, Lim HW. Vitamin D in health and disease. *Photodermatol Photoimmunol Photomed* 2010; 26:224-229.
- Ginde AA, Mansbach JM, Camargo CA Jr. Association between serum 25-hydroxyvitamin D level and upper respiratory tract infection in the Third National Health and Nutrition Examination Survey. *Arch Intern Med* 2009; 169(4):384-390.
- Li F, Peng M, Jiang L, et al. Vitamin D deficiency is associated with decreased lung function in Chinese adults with asthma. *Respiration* 2011; 81(6):469-475.
- Sutherland ER, Goleva E, Jackson LP, Stevens AD, Leung DY. Vitamin D levels, lung function, and steroid response in adult asthma. *Am J Respir Crit Care Med*. 2010; 181(7):699-704.
- Black PN, Scragg R. Relationship between serum 25-hydroxyvitamin D and pulmonary function in the third national health and nutrition examination survey. *Chest*. 2005; 128(6):3792-3798.
- Shaheen SO, Jameson KA, Robinson SM, et al. Relationship of vitamin D status to adult lung function and COPD. *Thorax*. 2011; 66(8):692-698.
- Lee J, Zhao H, Fenta Y, Kita H, Kumar R, Juhn YJ. Serum 25-hydroxyvitamin D is associated with enhanced pneumococcal antibody levels in individuals with asthma. *Allergy Asthma Proc*. 2011; 32(6):445-452.
- Al-Zayadneh E, Alnawaiseh NA, Ajarmeh S, Altarawneh AH, Albataineh EM, AlZayadneh E et al. Vitamin D deficiency in children with bronchial asthma in southern Jordan: a cross-sectional study. *J Int Med Res* 2020; 48(12):0300060520974242.
- Wang Q, Ying Q, Zhu W, Chen J, Vitamin D and asthma occurrence in children: A systematic review and meta-analysis. *J Pediatr Nurs* 2022; 62:e60-8.
- Al-Thuqfan SS, Alolayan SO, Ahmed S, Emara MM, Awadallah MF. Impacts of deficiency in vitamin D derivatives on disease severity in adult bronchial asthma patients. *Pulm Pharmacol Ther* 2021; 70:102073.
- Korn S, Hubner M, Jung M, Blettner M, Buhl R. Respiratory Research 2013; 14:25.