

## STUDY OF VITAMIN D LEVELS AND ITS CORRELATION WITH BMI IN ASTHMATIC FEMALES

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### ABSTRACT

**Background:** Asthma is amongst the commonest chronic diseases worldwide. It is an atopic disease characterized by chronic airway inflammation and hyper-responsiveness. Vitamin D has a role as immunomodulator by interacting with T lymphocytes, dendritic cells, mast cells, monocytes and macrophages. Vitamin D receptor is present in the bronchial smooth muscle. Vitamin D alters the airway smooth muscle expression of chemokines and inhibits the expression of a steroid resistant gene. Vitamin D deficiency has been correlated with elevated BMI.

**Aims and objective:** To estimate Vitamin D levels in asthmatic females (cases) and non-Asthmatic females (controls) and to establish a correlation between Vitamin D and BMI.

**Method:** The study was conducted in Govt. Medical College, Kota and attached group of hospitals during December 2014 to January 2016. A total of 60 females of age group between 20 - 40 years were included, out of which 28 females were healthy as control and 32 were diagnosed cases of asthma. Estimation of vitamin D (25OH vitamin D) was done by Chemiluminescence in Hormonal Assay Lab Biochemistry Department Govt. Medical College, Kota. Serum level of vitamin D were categorized into normal ( $\geq 30$  ng/ml or 75 nmol/l), insufficient ( $\geq 20$  to  $< 30$  ng/ml) and deficient ( $< 20$  ng/ml or 50nmol/l).

**Results:** Vitamin D deficiency ( $< 20$  ng/ml) was seen in 18.7% of cases and 14.2% of controls. P value is  $< 0.05$  which is significant. The Pearson's correlation between Vitamin D and BMI ( $r = -0.50$ ). By this study we conclude that Vitamin D deficiency is more prevalent in asthmatic patients. There is a negative correlation between Vitamin D and BMI. Serum vitamin D could be considered in the routine investigation of patients with asthma.

**KEYWORDS:** Asthma, BMI, Immunomodulator, Vitamin D

### INTRODUCTION

Asthma is defined by characteristic features such as airway hyper-responsiveness airflow obstruction, and paroxysmal cough, dyspnea, and wheezing, which are associated with chronic airway inflammation (Innes et al 2006, Global Initiative 2009). It is a complex heterogenous disease caused by variety of etiological agent. Asthma is a disease affecting any age group.(WHO 2010). It is one of the most prevalent diseases in both developed and developing countries (Akinbami LJ et al 2011).As of 2011, 235- 330 million people worldwide were affected by asthma.(WHO 2013).

Vitamin D is a fat soluble vitamin which is not only a dietary constituent but also a hormone (William J Marshal 2014). It can be obtained from foods and generated endogenously from sunlight exposure via a photosynthetic mechanism

in the skin (M.F. Holick 2007). Vitamin D is a potent modulator of the immune system (Weiss ST et al 2007) and is involved in regulating cell proliferation and differentiation (Litonjua AA 2008). Vitamin D have a role in both innate and adaptive immunity by promoting phagocytosis, modulating the effect of regulatory T cells (A.F. Gombart et al 2005, V. Matheu, et al 2003). Vitamin D receptor is present in the bronchial smooth muscle (Bosse Y et al 2007). Vitamin D alters human airway smooth muscle expression of chemokines and inhibits the expression of a steroid resistant gene (A. Banerjee et al 2008). Vitamin D deficiency has been associated with increased airway hyperresponsiveness, lower pulmonary function, worsen asthma.(M.S. Sandhu 2010, Brehn JM et al 2009, Black PN 2005).

Serum level of vitamin D were categorized into normal ( $\geq 30$  ng/ml or 75 nmol/l), insufficient ( $\geq 20$  to  $<30$  ng/ml) and deficient ( $< 20$  ng/ml or 50 nmol/l) (Ritu G et al 2014, O'Hartaigh B et al 2013).

The BMI is defined as the body mass divided by the square of the body height(WHO 2012) The BMI is an attempt to quantify the amount of tissue mass in an individual, and then categorize BMI in underweight: under 18.5, normal weight: 18.5 to 25, overweight: 25 to 30, obese: over 30 (Dr. Malcolm Kendrick 2015.)

Vitamin D deficiency has been correlated with elevated BMI (Munger KL et al 2006, Gordon CM 2011). Risk for developing asthma is 2.5 times higher when body weight had increased by 25 kg/m<sup>2</sup> (Camargo et al. 1999).

The prevalence of asthma is higher in males than in females before adolescence, but this trend is reversed after adolescence.(Osman M 2003, Almqvist C et al., 2008, Chen W et al., 2008) This reversal in sex ratio after puberty is caused by late incidence of asthma among girls(Nicolai T et al., 2003)

## **AIMS AND OBJECTIVE**

To estimate Vitamin D levels in asthmatic and non- asthmatic females and establish a correlation between Vitamin D and BMI.

## **MATERIAL AND METHODS**

The study was conducted in Govt. Medical College, Kota and attached groups of Hospital during December 2014 to January 2016..

A total of 60 females of age group between 20 -40 years were included in the study, Out of which 32 females were diagnosed cases of asthma and 28 were non-asthmatic healthy females. Exclusion criteria's were,

the patients with diabetes, parathyroid disease metabolic bone disease, chronic kidney disease, liver disease, pregnancy, malignancy, chronic drug use like antiepileptic agents, steroids and history of calcium or vitamin-D supplementation in the last one year, which are likely to interfere with vitamin-D metabolism.

## **SAMPLE**

The samples were collected after consent of the patients, 2ml of blood was withdrawn. Serum was separated by centrifugation at 3000 rpm for 10 minutes and analyzed Vitamin D level by Roche cobas e 411 by Chemiluminescence in Hormonal Assay Lab in Biochemistry Department Govt. Medical College, Kota. Body Mass Index (BMI) was calculated from measured height and weight.

## STATISTICAL ANALYSIS

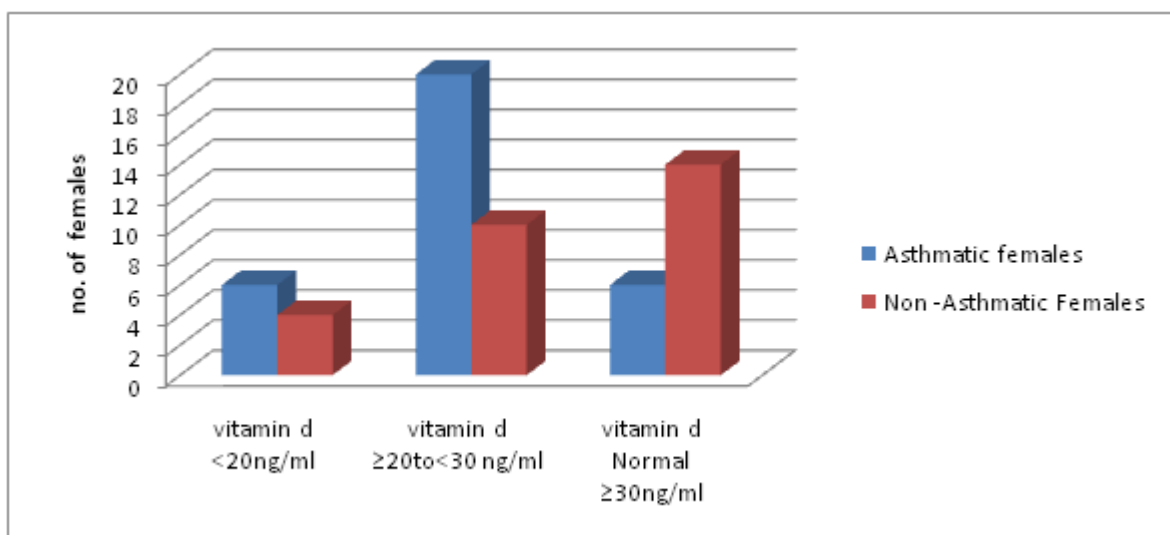
The statistical analysis was performed by using Microsoft Excel Program. The results were compared between asthmatic (cases) and non asthmatic females (controls) by Student's unpaired t test. The results were expressed as mean  $\pm$  standard deviation.  $P < 0.05$  was considered statistically significant. Correlation was assessed by Pearson correlation between Vitamin D and BMI.

## RESULTS

Among the total 60 females, 32 females were diagnosed cases of Asthma and 28 females were as healthy control. 18.7% of asthmatic females were found vitamin D deficiency ( $< 20$  ng/ml), 65.6% had vitamin D insufficiency ( $\geq 20$  ng/ml to  $< 30$  ng/ml), and 15.7% had vitamin D normal ( $\geq 30$  ng/ml). In non asthmatic females, 14.2% were in vitamin D deficiency ( $< 20$  ng/ml), 35.7% were found vitamin D insufficiency and 50% had normal vitamin D. The occurrence of vitamin D deficiency in asthmatic cases was more as compare to controls.

**Table 1: Vitamin D Levels in Cases and Controls**

| Vitamin D Level (Ng/MI)                             | Asthmatic Female (Cases)<br>(N=32)<br>No. Percentage |       | Non Asthamatic Females (Control)<br>(N=28)<br>NO. Percentage |       |
|---|--|-------|--|-------|
|   | $< 20$ ng/ml<br>Vitamin D Deficient                  | 6     | 18.7%  | 4     |
| $\geq 21$ to $< 30$ ng/ml<br>Vitamin D Insufficient | 21   | 65.6% | 10   | 35.8% |
| $\geq 30$ ng/ml<br>Vitamin D Normal                 | 5  | 15.7% | 14   | 50%   |

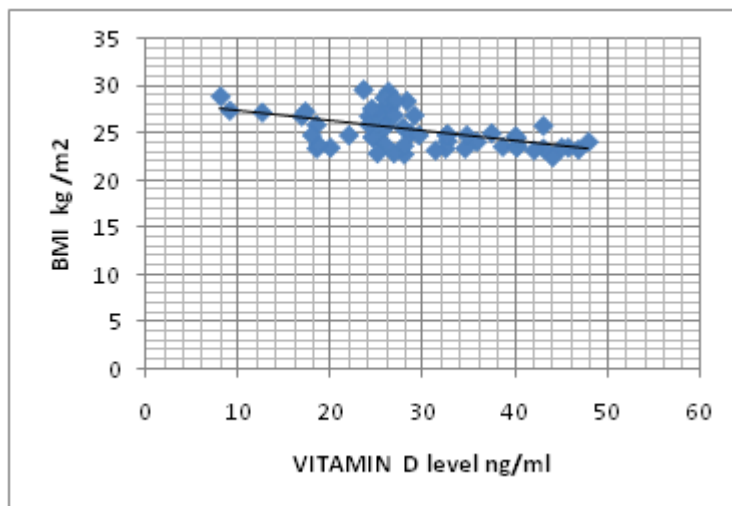


**Graph1: Showing Vitamin D Level in Cases and Controls**

The mean  $\pm$  SD of age is  $32.03 \pm 6.07$  in cases and  $34.57 \pm 4.67$  in controls. The mean  $\pm$  SD of Vitamin D is  $24.96 \pm 6.99$  in cases and  $33.86 \pm 9.38$  in controls. The mean  $\pm$  SD of BMI is  $26.72 \pm 1.86$  in cases and  $24.71 \pm 1.29$  in controls. P value is  $< 0.05$  significant. The Pearson's correlation between Vitamin D and BMI ( $r = -0.50$ ). There is an inverse association between Vitamin D and BMI.

**Table 2: Mean  $\pm$ SD Of Age, Vitamin D and BMI in Cases and Controls**

| PARAMETERS            | Asthmatic Females. (n=32)<br>Mean $\pm$ SD | Control Females. (n=28)<br>Mean $\pm$ SD | P Value           |
|-----------------------|--|--|-------------------|
| Age (years)           | 32.03 $\pm$ 6.07                           | 34.57 $\pm$ 4.67                         | 0.07              |
| Vitamin D (ng/ml)     | 24.96 $\pm$ 6.99                           | 33.86 $\pm$ 9.38                         | <0.05 significant |
| BMI kg/m <sup>2</sup> | 26.72 $\pm$ 1.86                           | 24.71 $\pm$ 1.29                         | <0.05 significant |

**Graph 2: Showing Correlation between Vitamin D and BMI**

## DISCUSSIONS

Asthma is a chronic inflammatory condition of the airways. Most of vitamin D is synthesized in the skin by ultraviolet light, although a small proportion of vitamin D comes through diet. Some behavioral factors result in such as excessive clothing coverage, sunscreen use, increased time spent indoors cause Vitamin D deficiency. The extra skeletal effects of vitamin D are currently the focus of research efforts (Rosen Cet al., 2012). Vitamin D modulates the function of immune cells including monocytes, macrophages, lymphocytes, and epithelial cells (Cutolo Met al., 2007). Our study is also agreement with F. Li. et al(2011) study, reported that, the concentration of 25(OH)D was low in asthmatic patients. Stephanie Korn et al. studied found that, 25(OH)D concentrations in adult asthmatics were low. There is an inverse association between Vitamin D level and BMI is agreement with another study (Black PN et al., 2005)

## CONCUSIONS

By this study we conclude that Vitamin D deficiency is more prevalent in asthmatic patients. There is a negative correlation between Vitamin D and BMI. Serum vitamin D could be considered in the routine investigation of patients with asthma.

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