

## Original Research Article

# Vitamin D levels in patients with bronchial asthma

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### ABSTRACT

**Background:** Bronchial asthma is one of the most common chronic diseases. In India, bronchial asthma has 66% frequency of reported exacerbations. Vitamin D has action on pro-inflammatory mediators and smooth muscle function and proliferation, which has direct relevance for lung function in asthma.

**Methods:** The cross sectional observational study was conducted in the Department of Medicine, Government Medical College Jammu for 10 months from January 2018-August 2018. 50 Patients of 18-60 years with diagnosis of bronchial asthma on the basis of clinical and radiological signs were included, while age matched 50 controls years free from any disease and morbidity were included and assessed for vitamin D levels.

**Results:** The mean serum vitamin D level was significantly low at  $26.13 \pm 4.91$  ng/ml in patients, while  $39.67 \pm 4.03$  ng/ml was the mean vitamin D level of controls. The vitamin D levels of mild and moderate (persistent) asthma patients was seen lower than those of the controls.

**Conclusions:** Vitamin D deficiency is highly prevalent in patients during exacerbations of bronchial asthma. It is also associated with lower lung functions and increased number of exacerbations. Thus improving vitamin D status may be effective in the prevention and treatment of bronchial asthma and exacerbations.

**Keywords:** Asthma, Exacerbations, Severity, Vitamin D

### INTRODUCTION

Bronchial asthma is one of the most common chronic diseases in the world. An estimated population of 300 million is affected by the disease. Prevalence of asthma ranges between 1% and 16% of the population globally, with Indian population reporting to be have 2.9% prevalence.<sup>1</sup> In recent times, much increase has been reported in both asthma and serum vitamin D deficiency throughout the world.<sup>2</sup> This increase has encouraged research on the subject of a relationship between asthma and serum vitamin D deficiency and studies conducted by several researchers are contributing valuably to this issue.

There is increasing number of studies related to the therapeutic benefits of vitamin D in patients with asthma. There exists a clear relationship between vitamin D deficiency and poorly controlled asthma.<sup>3</sup> It has been

reported that there is a relationship between vitamin D deficiency and increase in the severity of the asthma with increased inflammation.<sup>4</sup> Some studies have stated that vitamin D supplementation has reduced severe asthma attacks other studies have reported that asthma attacks requiring steroid treatment have significantly reduced with the supplementation of vitamin D.<sup>5</sup> Vitamin D receptors expressed in multiple lung cell and acts to protection from asthma by several mechanisms affecting inflammation, promoting lung immunity and slowing cell cycling hyperplasia.<sup>6</sup>

The objective of this study was to systematically review the evidence for an association between low serum levels of vitamin D and presence of asthma and to determine serum vitamin D levels in patients of bronchial asthma and compare it with controls.

**METHODS**

The cross sectional observational study was conducted in the Department of Medicine, Government Medical College Jammu for 10 months from January 2018-August 2018.

**Inclusion criteria**

Patients of 18-60 years with diagnosis of bronchial asthma on the basis of clinical and radiological signs and symptom with spirometer criteria (FEV1/FVC<0.7%, FEV1<80%) with significant bronchodilation.

**Exclusion criteria**

Patients on barbiturates, biphosphonates, sulfasalazine, diabetics, smokers, and patients having comorbid diseases that could affect vitamin D levels such as ulcerative colitis, Crohn’s disease, osteomalacia, cystic fibrosis and thyroid dysfunction were excluded.

Controls were healthy subjects of age 18-60 years free from any disease and morbidity.

Following investigations were done for all the patients: chest x-ray PA view, spirometry, serum vitamin D levels.

Serum vitamin D levels were assessed via Abbott Architect Chemi-luminiscent micro-particle immunoassay for vitamin D deficiency, and data was analyzed using SPSS-19 version (SPSS for windows).

Serum 25(OH)D concentrations and respective status of sufficiency or deficiency is clearly defined (Table 1).<sup>7</sup> While vitamin D deficiency can be further classified. (Table 2).

**Table 1: Serum 25(OH)D concentrations and health status.**

Vitamin D status		
<b>Normal (sufficient)</b>	30-50 ng/ml	75-125 nmol/l
<b>Insufficient</b>	20-29 ng/ml	50-75 nmol/l
<b>Deficient</b>	<20 ng/ml	<50 nmol/l
<b>Severely deficient</b>	<12 ng/ml	<30 nmol/l

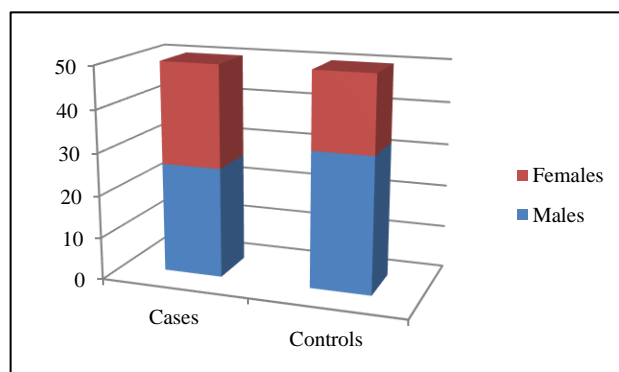
**Table 2: Classification of vitamin D deficiency.**

Type of deficiency	Range
<b>Severe hypovitaminosis D</b>	<5 ng/ml
<b>Moderate hypovitaminosis D</b>	5-10 ng/ml
<b>Mild hypovitaminosis D</b>	10-15 ng/ml

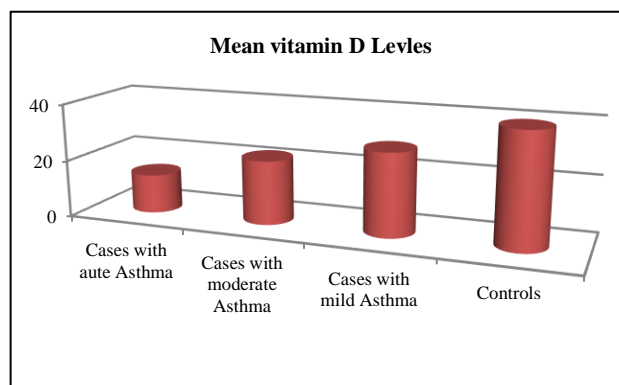
**RESULTS**

This case-control study was performed on 100 subjects, within the age-group of 18 to 60 years. Out of the 50

controls, 18 were females (36%), while out of the 50 cases, 24 were females (48%) (Figure 1). The mean serum vitamin D level was significantly low at 26.13±4.91 ng/ml in patients, while 39.67±4.03 ng/ml was the mean vitamin D level of controls. There was further significant relation between vitamin D levels and severity of Asthma as well, as similar difference could be observed between the controls and patients with mild and moderate asthma as well. The vitamin D levels of mild and moderate (persistent) asthma patients was seen lower than those of the controls (Figure 2).



**Figure 1: Male to female ratio among cases and controls.**



**Figure 2: Mean vitamin D levels in cases and controls.**

However no clear significant relation could be ascertained between vitamin D levels and gender in the course of this study however increased incidence of Asthma among females with low vitamin D show their vulnerability.

**DISCUSSION**

Vitamin D has a significant impact on respiratory system as it can influence immunity and cell functions. The ability of lung epithelial cells to synthesize active vitamin D by 1 alpha hydroxylase and the presence of vitamin D receptors polymorphisms supports this. Hejazi et al demonstrated the association between lower vitamin D levels many lung diseases including respiratory tract infections COPD, tuberculosis and bronchial asthma.<sup>8</sup>

However, Korn et al stated the same in their study of association between vitamin D deficiencies with asthma exacerbations.<sup>9</sup> Samarah et al and EI Aaty et al who found a significant difference in vitamin D levels between asthmatics and healthy controls.<sup>10,11</sup>

Studies have often established association between serum vitamin D levels and asthma incidence.<sup>12</sup> However there was an increased frequency in children (cases with lower age group) with decreased levels of vitamin D. Many studies have also gone on to show a progressive but negative relation of decreasing vitamin D levels with the severity of asthma.<sup>13</sup> Our study is quite in line with similar study performed by Mohamed et al in 2017 showed low mean serum vitamin D levels in patients as compared to controls.<sup>14</sup>

Obesity affects vitamin D independent of its effect on other respiratory diseases as well, which also acts as a confounding factor. Asthmatics spend more time indoors and thus have less physical activity, less exposure to sunlight, which may be the confounding factor and corresponding limitation.

## CONCLUSION

Vitamin D deficiency is highly prevalent in patients during exacerbations of bronchial asthma. It is also associated with lower lung functions and increased number of exacerbations. Thus improving vitamin D status may be effective in the prevention and treatment of bronchial asthma and exacerbations. Asthmatic patients can be educated regarding the importance of physical activity, intake of vitamin D rich food, along with exposure to sunlight for better management and routine care.

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