Cystic Fibrosis (CF) is a genetic disease whose clinical symptoms often manifest in the pulmonary and gastrointestinal systems. Patients with CF often suffer from nutritional deficiencies, especially fat-soluble vitamin deficiencies. Recent research indicates that vitamin D, a fat-soluble vitamin, might play a role in pulmonary function. Studies demonstrate that approximately 90% of CF patients are deficient in vitamin D. The purpose of this review is to explore the effects of vitamin D deficiency on pulmonary function in CF patients. Five research articles were evaluated using the Academy of Nutrition and Dietetics Evidence Analysis Process in response to the PICO question: In people diagnosed with cystic fibrosis, do those deficient in vitamin D, compared to those who are not deficient in vitamin D, have reduced pulmonary function?

Abstract

In people diagnosed with cystic fibrosis, do those deficient in vitamin D, compared to those who are not deficient in vitamin D, have reduced pulmonary function?

<table>
<thead>
<tr>
<th>Authors, Year, Study Design, Class Rating</th>
<th>Purpose</th>
<th>Finding/Authors Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chedchadai S, Tangpricha V 2016 Review</td>
<td>To show that vitamin D may be beneficial for CF and may also be used as a microbe and anti-inflammatory.</td>
<td>Vitamin D deficiency is associated with a decline in pulmonary function.</td>
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<tr>
<td>K, Herscovitch, N. Dauletbear, Larry C. Lands 2014 Review</td>
<td>To illustrate the possibility for supplementation with vitamin D or how it can balance inflammation and protect against chronic infection in CF patients lungs.</td>
<td>Vitamin D deficiency is associated with a decline in pulmonary function in adults, though not children. Vitamin D supplementation improves forced expiratory volume in 1 second (FEV1).</td>
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<tr>
<td>McCauley L et al 2014 Retrospective Longitudinal Study Class Rating: D</td>
<td>To show that children with CF who have 25-hydroxyvitamin D (25-OHD) levels less than 30 mg/L would have lower percent lung function and more pulmonary exacerbations than those with 25-OHD greater than or equal to 30 mg/L.</td>
<td>Patients deficient in vitamin D had a high incidence of pulmonary exacerbations. In adolescents, but not children, improvements in vitamin D levels resulted in an improvement in forced expiratory volume in 1 second (FEV1).</td>
</tr>
<tr>
<td>Sexauer W, Hadeh A, Mallowe A, et al 2015 Retrospective Chart Review Study Class Rating: D</td>
<td>To determine the impact of vitamin D and how it effects lung function by studying five hundred and ninety seven patients that were older than six years old and excluded patient that had a history of organ transplants and subjects who had emphysema.</td>
<td>CF patients who were deficient in vitamin D had significantly lower pulmonary function as measured by forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV1)</td>
</tr>
<tr>
<td>Vanstone M, Egan M, Zhang J, Carpenter T 2015 Retrospective Chart Review Study Rating: D</td>
<td>To identify the cause of vitamin D status, as defined by circulating 25-hydroxyvitamin D (25-OHD) levels on the weekly frequency of pulmonary exacerbations (Pex) and hospitalizations, on standard measures of pulmonary function, and to identify the cause of 25-OHD levels in pediatric patients with cystic fibrosis.</td>
<td>CF patients who had low or insufficient vitamin D levels had increased incidence of pulmonary exacerbations and higher incidence of hospitalization. Vitamin D status did not affect pulmonary function tests.</td>
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Background:

- CF is a genetic disease that causes lung infections and makes it hard for the individual to breathe. The likelihood for CF patients to suffer from vitamin D deficiency is very high. Up to 90% of the population suffers from insufficiency and deficiency of vitamin D.
- Vitamin D deficiency in patients with CF could be related to pancreatic exocrine insufficiency, lack of outdoor activity, and alterations in vitamin D metabolism. The results of Vitamin D deficiency in CF patients are poor mineralization of their bones and inflammation.
- Recent studies have shown that higher doses of Vitamin D supplementation can help improve lung function and can be used as an adjunct to therapy for recovery pulmonary exacerbations.
- The Cystic Fibrosis Foundation recommends that everyone with CF have their 25-Hydroxyvitamin D levels checked at least yearly. The target level is greater than or equal to 30 ng/ml. According to the Third National Health and Nutrition Examination Survey, there was a positive relationship between vitamin D status and lung function. The potential mechanisms by which vitamin D may preserve lung function include improved airway remodeling in response to injury, decreased airway inflammation, and decreased airway bacterial colonization.

Conclusions

The majority of evidence reviewed indicated that in adults and adolescents, vitamin D deficiency was associated with a decline in pulmonary function, while vitamin D supplementation improve pulmonary function. Vitamin D supplementation did not make a significant difference in improving pulmonary function in children with CF. No negative effects were noted with Vitamin D supplementation, it is advisable to check Vitamin D levels in all CF patients and add supplementation when indicated.

References