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Review Article

What is the Effect of Diabetes on Lung Health and What Can be Done to Prevent This?

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Abstract

Diabetes, which has affected millions of people globally, has been shown to significantly impact lung health, a side effect that is often overlooked in typical diabetic complications. Recent research has highlighted the link between elevated blood sugar levels and decreased lung capacity, with conditions such as asthma and COPD being having an aggravated likelihood of occuring in diabetic patients. This article aims to establish the correlation between diabetes and lung health, emphasising the importance of exercise and a healthy lifestyle. There has been no distinct connection established between the health of lungs and diabetes, although recent research has begun to develop a relationship between these two factors.

Keywords: *Type 1 Diabetes; Type 2 Diabetes; Chronic Obstructive Pulmonary Disease; Asthma; Insulin Resistance*

Abbreviation

COPD: Chronic Obstructive Pulmonary Disease

Introduction

Diabetes, a common condition, that affects 422 million people globally. It has been known to have caused a severe effect on various parts of the body. Although one of the hidden effects is on the health of lungs and people already with preexisting lung related health issues. In recent years, researchers have been trying to create a connection between the health of lungs and insulin resistance due to diabetes.

Researchers across the globe have been investigating. A research conducted by Imperial's Department of Metabolism, Digestion and Reproduction suggested that, based on the modelled data studied, an increase in average blood sugar levels from 4 to 12 mmol/L, resulted in a 20% decrease in lung capacity and function. Hence, this is a depiction of the inevitable deteriorating lung condition.

What is diabetes mellitus?

It is a form of a systemic and metabolic disorder which causes abnormally high levels of glucose and elevated blood. This is associated with oxidative stress and inflammation. This further leads to micro and macro vascular damage to multiple organs including the cardiovascular system, the retina and the kidney to name a few. It is currently being investigated widely as to the extent of the relationship between lungs and diabetes, but presently there is minimal evidence present.

The perplexing relationship between asthma and diabetes

Initially, research had concluded that it would prevent asthma due to the anti-inflammatory properties of the insulin given to diabetic patients. Later, this conclusion was proven to be incorrect and that the risk of asthma in diabetic patients is in fact more than double as compared to non-diabetic patients. This is due to airway hyperresponsiveness in humans. Especially type 2 diabetes are shown to have a significantly greater chance to show symptoms of breathlessness and lung related diseases such as tuberculosis, fibrosis etc. Diabetes in asthma patients is an essential comorbidity which can lead to further severe asthma in patients previously suffering from it. This would also increase the patient becoming more serious and facing further health complications. Diabetes has also been known to cause sputum hypersecretion which leads to an obstruction in the airway hence leading to a rapid decline in the health of the lungs due to the inefficient passage of air in and out of the body.

An interplay between chronic obstructive pulmonary disease and diabetes

The right concentration of glucose is required in the body as it stimulates the growth of respiratory organs at the airway and resistance towards insulin would cause inflammation which leads to a condition known as chronic obstructive pulmonary disorder otherwise also referred to as COPD where the lung of the patient begins to deteriorate and cause persistent inflammation further leading to the narrowing of the respiratory tract and make it difficult to breathe. While COPD isn't curable, the life expectancy of a patient can be high with medications and treatment as long as they don't have any other health conditions. One of the main conditions is diabetes. The coexistence of these conditions has caused severe consequences leading to hospitalisation and mortality.

Lung cancer and diabetes

It has also been observed that diabetes can cause lung cancer or worsen pre existing lung cancer, while this requires further investigation, it is suggested that due the permanently elevated blood levels which is caused by diabetes leads to rapid reproduction of cancerous cells. Specifically, type 1 is known to increase the likelihood of lung cancer. Furthermore, women with pre-existing diabetes have shown a trend of lower survival rate with cancer, hence this is also considered as a prognostic factor in lung cancer. Additionally, diabetes can influence the progression and prognosis of cancer. It can accelerate the rate of metastasis and tumour growth.

What can we do to prevent this or reduce the effects?

Physical therapists can prevent the side effects caused due to diabetes by an exercise routine. The routine will aim to lower the elevated blood sugar levels, the exercises will reduce if not prevent the effect on the lungs and assist it in being as healthy as possible. Additionally, patients will be advised to have a light exercising and healthy diet. Research has proven that obesity also increases the severity of the side effect on other organs including the lungs. Smoking is strictly advised against as it can worsen the health of the lungs. Furthermore, diabetes is known to weaken the immune system leading to a greater risk and exposure to diseases and viruses and a tougher recovery period. As seen throughout this article, asthma has been a very common side effect on the lungs due to both type 1 and type 2 diabetes hence physiotherapists may provide patients with breathing exercises.

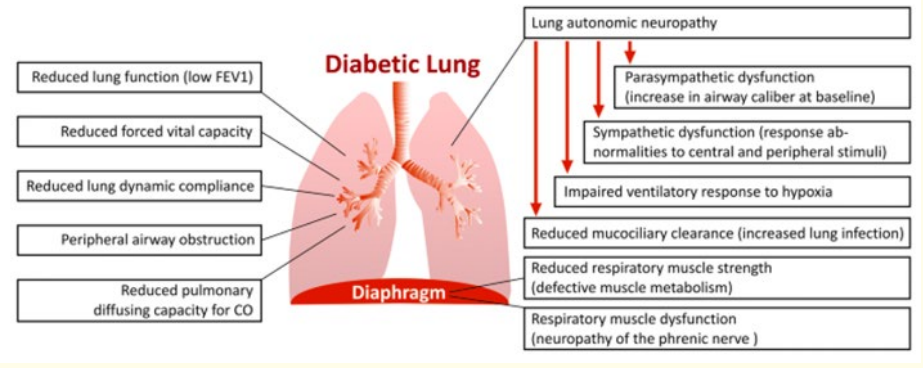

Figure 1

The image shown above displays a diabetic lung and lists some of the effects on the lungs due to diabetes. It also is a great display of the various complications a diabetic patient could face or what they should expect. The right concentration of glucose is required in the body as it stimulates the growth of respiratory organs at the airway and resistance towards insulin would cause inflammation which leads to a condition known as chronic obstructive pulmonary disorder otherwise also referred to as COPD where the lung of the patient begins to deteriorate and cause persistent inflammation further leading to the narrowing of the respiratory tract. It has also been observed that diabetes can cause lung cancer or worsen pre existing lung cancer, while this requires further investigation, it is suggested that due the permanently elevated blood levels which is caused by diabetes led to rapid reproduction of cancerous cells. High blood glucose levels cause fatty deposits in the blood vessels.

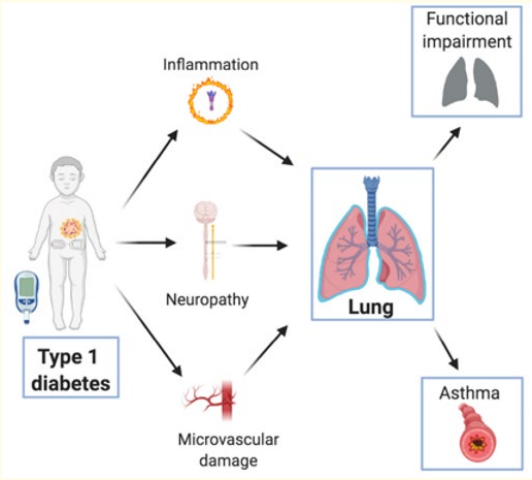

Figure 2

While mainly type two diabetes is known more commonly to have greater effect on the lungs, the image displayed above shows how type one diabetes can lead to asthma and functional ailment, this is due to three possibilities as shown which are neuropathy, inflammation and microvascular damage all affecting the lungs.

Conclusion

In conclusion, diabetes not only impacts common organs such as the heart, kidneys, and eyes, but also has a profound effect on the health of the lungs. This link between diabetes and asthma, COPD or lung cancer further adds evidence to the disease being systemic. High blood sugar in association with insulin resistance stimulates inflammation as well as a systemic condition, thereby causing severe loss in lung capacity and increasing susceptibility towards lung complications. Early interventions for example regular exercise, a healthy diet, and not smoking can help mitigate these risks, making it pivotal for diabetic patients to prioritise their lung health alongside monitoring other possible complications. The research on this topic needs to be further continued to fully understand the relationship between diabetes and lung disease, which could open doors to better prevention and treatment strategies in the future [1-11].

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