

# Association between Diabetes Mellitus and Tuberculosis

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## Short Communication

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## ABSTRACT

A literature review was conducted to give insight on the association between type 2 diabetes mellitus and Tuberculosis. A research was done to find relevant articles that explain the association between the two conditions. It is hypothesised that there is an association between Diabetes Mellitus and tuberculosis.

**Aim:** The aim of this paper is to investigate the association between Diabetes Mellitus and tuberculosis.

**Methods:** A literature review was done to find articles that support or oppose the hypothesis.

**Result:** It was concluded from various articles that there is an association between Diabetes Mellitus and Tuberculosis.

**Conclusion:** Truly there is a correlation between Diabetes Mellitus and Tuberculosis.

## INTRODUCTION

According to the World Health Organisation (2018) TB is caused by a microorganism, bacteria called Mycobacterium tuberculosis which affects the lungs mostly and it is spread through person to person via air<sup>[1]</sup>. Although tuberculosis (TB) is curable and preventable, 5-15% of people infected with TB falls ill (WHO, 2018). People with compromised immune systems such as those that are HIV positive, malnourished and those with diabetes have a higher risk of falling ill and getting TB. One-third of the world's population is said to be infected with TB in which 9 million people get infected every year leading to 2 million deaths of the population annually<sup>[2]</sup>.

On the other hand, Diabetes Mellitus (DM) is characterised as a disease that is caused by high blood level as a result of insulin resistance and beta cell failure<sup>[3]</sup>. One of the biggest public health issues worldwide is diabetes. Towards the end of 2017, 425 million people globally were living with diabetes and it is said to increase to 629 million by 2045<sup>[4]</sup>. Several studies have shown that 90% of cases of diabetes are type 2 diabetes mellitus (T2DM)<sup>[5]</sup>. The increase in T2DM is a re-emerging risk and challenge to TB prevalence<sup>[6]</sup>.

It is important to note that both TB and T2DM are a serious public health issue in which the association between both diseases can become the next global health issue. The first report on the association between DM and TB was reported first by Avicenna over 1000 years ago<sup>[7]</sup>. Research shows that people with DM are three times more likely to develop TB than those without DM<sup>[6]</sup>. This means that people with a weak immune system such as people living with diabetes are at higher risk of getting TB. Also, there is more TB-DM comorbidity than TB-HIV comorbidity. Similarly, it is estimated at a global level that 15% cases of TB are attributable to DM and 40 % of those cases occur in India and China<sup>[8]</sup>. However, at the population level, 10-20% cases of TB occur as a result of Diabetes although it varies from country to country<sup>[6]</sup>.

## RESEARCH QUESTION

Is there an association between Diabetes Mellitus and Tuberculosis?<sup>[9]</sup>

## METHOD

Previous studies done in TB and DM are usually observational studies with few cohort studies and cross-sectional study<sup>[6]</sup>. This paper, however, reviewed various articles in order to determine the association between DM and TB.

## SELECTION CRITERIA

A literature review was conducted between 10<sup>th</sup> of November 2018 to 25<sup>th</sup> of November 2018 drawing studies from Monash University South Africa database. Articles were gotten from Google scholar and PubMed. The key terms used in this paper included Diabetes, Tuberculosis, Risk factor, Association and public health issue globally. The articles included in this paper were articles that were published between 2012-2018. Also, articles that are written in English language and that consisted of the key terms were the ones considered for this paper. A lot of studies and articles were searched for; however, only 12 articles were used in this paper.

## RESULTS

Several studies have proven the association between DM and TB. From those studies, it was revealed that people with DM are three times at higher risk of developing TB than those without DM. Due to this, the WHO and International Union against TB and Lung Disease have acknowledged the fact that there should be a joint control and management of both TB and DM <sup>[10]</sup>.

### Does diabetes cause Tb?

From a systematic review of 13 observational studies, it was found out that DM increases the risk of TB by three-fold (relative risk 3.11; 95% CI 2.27-4.26) <sup>[6]</sup>. There is a correlation between DM and TB mainly due to the weak immune system of diabetes patients which makes them more susceptible to getting infections such as TB <sup>[7]</sup>. As a matter of fact, people living with diabetes suffer from a lot of pulmonary abnormalities which leads to delayed clearance of microorganisms from the respiratory system which aids the spread on infections in the host <sup>[2]</sup>. This is because people with diabetes have high blood glucose level which tends to compromise their immune system and does not allow their body to fight off TB <sup>[14]</sup>. Similarly, people with diabetes are said to be hyperglycemic, and research has proven that hyperglycemia helps in the growth of tuberculosis bacilli <sup>[6]</sup>. However, not everyone with diabetes has a weak immune system. Hence, it is important to maintain and monitor blood glucose level <sup>[12]</sup>.

### Does TB cause diabetes?

Surinder Pal Singh, et al. asserts that the association between TB and DM is bidirectional <sup>[13]</sup>. This is because one of the anti-tubercular drugs rifampicin is said to interfere with the metabolism of oral hypoglycemic agents, thereby affecting glycaemic control, hence making TB drug a risk factor for DM <sup>[13]</sup>. On the other hand, the Centre for Diabetes and Endocrinology claims that TB does not cause diabetes. This is because a lot of people stay undiagnosed with diabetes <sup>[11]</sup>. Hence, people with undiagnosed DM may have very high blood glucose levels. Therefore, when patients with undiagnosed DM get diagnosed with TB, they assume the TB facilitated the development of the DM. But on the contrary to their belief, they have had DM before the TB. Although, having TB can also increase blood glucose levels as well as some TB drugs? Also, TB is known to worsen diabetic state, this is because tuberculosis can lead to glucose intolerance which may predispose one to DM <sup>[14]</sup>. A study shows that TB is detrimental to insulin production, however little is known about insulin resistance as a risk factor for TB <sup>[8]</sup>.

## CONCLUSION

The result of this study shows that, there is truly an association between DM and TB. This is because all the papers reviewed concluded that, DM patients are at higher risk of getting TB due to compromised immune system. But, only few papers claimed that TB is a risk factor for DM. Therefore, DM is now considered one of the most common causes of a compromised immune system that favors TB. However, more study is still needed to determine if truly tuberculosis is a risk factor for diabetes as different study oppose and support the claim. This shows that it is still unclear how tuberculosis is a risk factor for diabetes. Hence, more research is needed in this area.

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