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Diabetes Case Reports

Editorial

# Prevalence of Tuberculosis: What Role Does Diabetes Play?

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## ABSTRACT

*Mycobacterium tuberculosis* develops tuberculosis, which is a fatal disease. The *Mycobacterium* affects the lungs initially. If the infection progresses beyond the lungs, the symptoms will vary depending on which organs are affected. Diabetes is a type of metabolic disorder in which a person's blood sugar level is too high. It's because the body doesn't create enough insulin, or the insulin that is produced isn't recognised by the body's cells. Diabetics have a three to five-fold increased risk of tuberculosis (TB) than those who do not have diabetes. Diabetes mellitus is a major risk factor for tuberculosis, and it can alter both the therapy and the response to the disease. Furthermore, TB can cause glucose intolerance and decreased glycemic control in diabetics. The primary goal of this review is to assess the epidemiology of diabetes and tuberculosis disease, as well as the impact of diabetes on tuberculosis and vice versa.

**Keywords:** Tuberculosis; Diabetes mellitus; Insulin; Hyperglycaemia; Blood glucose levels

## DESCRIPTION

*Mycobacterium tuberculosis* is a non-motile, aerobic bacillus. The high fat content of this pathogen accounts for its distinct clinical features. *Mycobacterium* divides every 16 to 20 hours, which is incredibly sluggish compared to other bacteria, which divide in less than an hour. It's a Gram-positive bacterium that doesn't have a cell wall and has a phospholipid outer membrane. Because of the high lipid and mycolic acid content of its cell wall, it dyes extremely faintly Gram-positive or does not absorb dye when stained with gram stain. It may survive for weeks in a dry state and is resistant to weak disinfectants. *M. tuberculosis* can be cultured and developed *in vitro*, unlike most bacteria that can only grow within the cells of a host organism. When a person inhales small minute particles of contaminated phlegm or sputum from the air, he or she becomes infected with tuberculosis germs.

Diabetes is a set of metabolic illnesses in which a person's blood sugar levels are abnormally high. It's either because the body doesn't create enough insulin or because the insulin that is produced isn't recognised by the cells.

### Diabetics are more susceptible to tuberculoses

Tuberculosis seems to be more common in diabetics or individuals who have diabetes, and it is associated with a higher fatality rate. In diabetics, reactivation of TB infections has been observed at higher rates. At the same time, tuberculosis appears to exacerbate diabetes, forcing patients to take larger insulin doses than before. In comparison to the overall population, tuberculosis patients appear to have a greater rate of diabetes than the general population

- Tuberculosis develops ten times more likely in diabetic infants.
- Tuberculosis typically develops after the beginning of diabetes in the majority of patients.
- The risk of pulmonary TB rises as diabetes progresses.

### Diabetic immune dysfunction

With the increased frequency of pulmonary tuberculosis in diabetics, host defence and immune cell functioning may be compromised. The immune system's cell-mediated arm is involved in the immunological disarray. Hyperglycemia has a specific effect on macrophage microbicidal function, with even brief exposures to blood sugar levels of 200 mg% dramatically lowering the respiratory burst of these cells. Tuberculosis takes a

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more destructive course and is associated with a greater mortality rate in poorly treated diabetics with high levels of glycated hemoglobin. Diabetics have been found to have a number of pulmonary physiologic abnormalities that contribute to infection clearance delays and infection spread in the host. Infection with tubercle bacilli causes changes in cytokines, monocyte-macrophages, and CD4/CD8 T cell populations.

## Tuberculosis and glucose intolerance

"Tuberculosis patients do not develop diabetes at a higher rate than non-tuberculosis patients." Various researches undertaken in nations such as India, Africa, and Tanzania, among others, have changed this viewpoint. In tuberculosis, impaired glucose tolerance (IGT) is far more common than overt diabetes. IGT reverts to normal in a substantial number of instances with effective chemotherapy, and the percentage with IGT is higher because, according to the National Diabetes Data Group of the NIH, one to five percent of patients with IGT move to overt diabetes each year.

## Glucose intolerance in tuberculosis: What causes it?

Acute extreme stress is a major contributor to the development of impaired glucose tolerance. Fever, prolonged inactivity, and starvation boost stress hormones such as adrenaline, glucagon, cortisol, and growth hormone, which elevate blood sugar levels excessively. In severe sickness, plasma levels of Tumor Necrosis Factor alpha (TNF alpha) and Interleukin-1 (IL-1) rise, which can trigger anti-insulin hormones? In tuberculosis patients, serum levels of adrenocorticotropic hormone, cortisol, and T3 were shown to be lower. All of these irregularities cast doubt on the patient's ability to respond to stress.

## Effects of anti-tuberculosis medications on blood sugar levels

Rifampicin is a potent inducer of the hepatic microsomal enzyme that decreases sulphonyl urea and biguanide levels in the blood. Rifabutin is a hepatic metabolism inducer that is not as effective as Rifampicin. Anti-tuberculosis drugs, for example, rarely impact with blood sugar levels. An overdose of isoniazid or isonicotinylhydrazine (INH) can cause hyperglycemia, and diabetes control in Pyrazinamide patients can be problematic in specific cases or circumstances.

# CONCLUSION

Diabetics and diabetics have a higher tuberculosis (TB) risk than non-diabetics. Diabetics who had recently come into touch with tuberculosis patients were the best candidates for treatment. Most countries are squandering opportunities to prevent tuberculosis in diabetic individuals. Clinicians diagnose diabetes in TB patients as well as TB in diabetics. Diabetes weakens or suppresses the immune system, making infection with *Mycobacterium* TB and/or development to clinical disease easier.