

The links between diabetes and tuberculosis

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The tremendous increase in the prevalence of diabetes mellitus (DM), predominantly in the developing world, is attributed to changes in socioeconomic status, diet and decreasing levels of physical activity. Of all the determinants of tuberculosis (TB), DM is one of the most widely distributed and, with a projected 'epidemic' in developing countries, DM threatens the downward trends of TB control, particularly in the regions where the two diseases co-exist.

Possible interactions

People with DM:

- may be more heavily exposed to TB
- may more easily get infected by TB given an exposure
- have higher risk of latent TB infection
- have a faster disease progression
- need to be screened for TB as this may contribute to early case detection and reduce transmission of TB

Among people with TB:

- DM may adversely affect TB treatment outcomes
- DM may accelerate the emergence of multi-drug resistant TB (MDR TB) among those receiving TB treatment
- TB medications may interfere with treatment of DM through drug interaction

National TB programmes around the world have emphasised the need for TB control through directly observed therapy strategy (DOTS). This approach has proved to be very successful, with substantial increase in the smear positive case detection rates and improved treatment outcomes. Although there has been a significant decrease in the incidence of TB globally since 2004 with the DOTS intervention, this decline has been much slower than expected. TB experts believe that in addition to DOTS, intervention will be necessary on DM and other known determinants – which include HIV/AIDS, smoking, malnutrition, alcoholism, crowded living conditions and indoor air pollution – to meet the current goals of TB control and elimination.

Although the primary objective needs to be strategies to reduce the burden of type 2 DM through appropriate primary, secondary and tertiary prevention programmes, other immediate interventions can include screening for active TB, screening and treatment of latent TB and modified treatment regimes to reduce infectiousness and improved outcomes of TB in people with diabetes. Conversely, screening for DM among those diagnosed with TB may help identify patients in need of long-term treatment and better control of blood glucose levels for DM and allow for appropriate follow up that might lead to improved outcomes.

Although the important association between DM and TB is not in doubt, previous studies published between 1965 and 2009 have several limitations. Many of them are health facility-based case control studies using medical chart diagnosis of DM and most are from developed countries with almost none from Africa. A recent report in *Tropical Medicine and International Health* on bi-directional screening for TB and diabetes (Jeon et al., 2010) summarised the available literature.

Findings: screening for TB among people with DM

- The prevalence of active TB in people with DM ranged from 1.7 per cent in Sweden in 1954 to 36 per cent in Korea in 1961.
- The annual incidence of TB ranged from 280/100,000 in people with DM in Korea to 488/100,000 in people with DM in Ethiopia.
- In people without DM (control group), the prevalence of TB ranged from 2.0 per cent in Hungary and the United States to 5.1 per cent in Korea.
- The prevalence of TB was more common in those with severe DM (insulin requiring) compared to those with a milder form of DM (2.8 per cent to 20.9 per cent).
- In South Africa, studies in 66 persons with insulin dependent diabetes (by medical records) and with no comparison group found incidence of TB per 100,000 was 10,606. However, the limitation of the study was that TB cases were determined by X-ray diagnosis and thus TB prevalence may be overestimated. Another study of 258 persons with type 1 diabetes and TB diagnosis made by X-ray chest and positive mantoux test, with no comparison group, found incidence of TB per 100,000 was 3,488.
- In India, studies in 1984 in 219 persons with diabetes and TB diagnosis made by positive sputum smear on three consecutive days reported an incidence of 4,110 TB cases per 100,000, while another study in 2002 reported an incidence of 6,000 TB cases per 100,000 where the diagnosis was made by X-ray chest and sputum smear.
- In an area where the prevalence of TB is less than 25 per 100,000 persons, at least 1,000 people with DM needed to be screened to yield one additional case of TB. In areas with high burden of TB (e.g., India where TB prevalence is estimated at 283/100,000, screening of 90-350 people with DM will yield one or more cases of TB.

From the studies reviewed, it is observed that the prevalence of TB in persons with DM was high. The degree of the increase

depended on several other 'drivers' including HIV/AIDS co-morbidity, socioeconomic environment (workplace, socioeconomic status), overall prevalence of TB in the area/country and severity and duration of diabetes.

Findings: screening for DM among people with TB

- The prevalence of diabetes screened after diagnosis of TB and initiation of treatment, reported in various studies ranged from 1.9 per cent in Nigeria to 10 per cent in India. This considerable variance depends on several factors including country prevalence, ethnicity and lifestyle.
- The prevalence of DM was higher in patients with TB (8.0 per cent) as compared to controls (2.78 per cent).
- The prevalence of DM prior to initiation of TB treatment ranged from 8.6 per cent (Turkey) to 19.8 per cent (Pakistan). The prevalence among those who did not report the timing of DM screening ranged from 2.1 per cent in India to 35.2 per cent in Mexico. In both these groups, prevalence of DM was higher in patients with diagnosed TB, with prevalence ranging from 1.83 per cent in Pakistan to 7.81 per cent in United Republic of Tanzania.

- In some of the studies where screening for DM was done at several time points during the course of anti TB treatment, there was a progressive decrease in the prevalence over a period of time.
- In places such as Mexico and India, with a high baseline prevalence of DM, screening 2–10 patients with TB would lead to the detection of at least one additional case of DM.

Screening of persons with DM for TB and screening of persons with TB for DM are thus important components of TB and DM control programmes.

Reference

Jeon, C.Y., Harries, A.D., Baker, M.A., Hart, J.E., Kapur, A., Lonnroth, K., Ottmani, S.E., Goonesekera, S. and Murray, M.B. 2010. Bi-directional screening for tuberculosis and diabetes: a systematic review. *Tropical Medicine and International Health* 15(11): 1300-14.

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