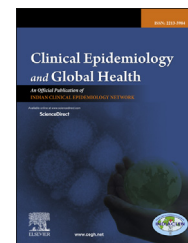




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## Original Article

# Burgeoning double burden of tuberculosis and diabetes in India: Magnitude of the problem – Strategies and solutions



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## ABSTRACT

**Background:** India reportedly has a fifth of tuberculosis burden worldwide. There is a strong epidemiological evidence for an association between tuberculosis and diabetes mellitus (DM). Patients with diabetes are at increased risk of developing active TB, and have higher rates of treatment failure and death, even when placed on appropriate therapy.

**Objective:** We sought to perform a comprehensive review of the convergence of these two epidemics in India and strategies for co-management.

**Methods:** We performed a literature search of current knowledge including observational studies and clinical trials and other position papers, from databases such as, Medline, Embase, worldwide web and other repository of WHO and other international and national reports with the following search terms: tuberculosis, diabetes mellitus, co-epidemics, India, management and strategies.

**Results:** Combined results from several cohort studies suggest that DM increases the risk of active TB by approximately three fold. This association between TB and DM will become more poignant in the coming years, as the prevalence of diabetes is expected to increase substantially in the developing nations. We describe the epidemiology of each disease in detail, and its convergence. We also discuss the challenges in co-management of TB and DM, including the role of nutrition. The article investigates the barriers, gaps in research data and opportunities to tackle this problem at the policy and grass roots level. The newly evinced approach of public private partnerships with market based partnerships for health (MBPH) need to be explored.

**Conclusions:** Treatment of diabetes as a co-disease presents an opportunity for collaboration with the current TB control efforts to be expanded. Considering the existing public health infrastructure and the overarching private sectors' role in the co-management, standard

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treatment guidelines which incorporate the core issues in the bi-directional screening and cost-effective management of TB and diabetes need to be developed and enforced.

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## 1. Introduction

India reportedly has the largest burden of TB cases in the world. According to the World Health Organisation (WHO) estimates of 2009, there were 1.6–2.4 million TB cases in India accounting to one fifth (21%) of the TB cases worldwide.<sup>1</sup> Simultaneously, India also has increasing number of diabetics, more than in any other country of the world.<sup>1,2</sup> As estimated by WHO, India had 32 million diabetic subjects in the year 2000 and this number would increase to 80 million by the year 2030.<sup>2</sup> Diabetes has been regarded as one of the key risk factors for TB because of the interaction between the two diseases. More and more research data is reporting the deleterious effects of diabetes on TB associated pathogenesis, infection control and management and leading health experts are expressing their grave concern on the merging epidemic of TB and diabetes in India.<sup>3</sup> Combined results from several cohort studies suggest that DM increases the risk of active TB by approximately three fold.<sup>3</sup> Our objective is to perform a comprehensive review of the convergence of these two epidemics in India and strategies for co-management.

### 1.1. Methodology

We performed a systematic literature review of current knowledge including original research such as observational studies and clinical trials, other position papers, from electronic databases such as, Medline, Embase, worldwide web and other repository of WHO and other international and national reports published between 1990 and 2012 with emphasis on the last ten years. We used the following search terms: tuberculosis, diabetes mellitus, co-epidemics, India, management and strategies. We synthesized the literature in the following subheads: as overall description of the epidemiology of each disease and then the information on combined epidemiology; issues in co-management; available services and magnitude of the problem; barriers, challenges and gaps; and co-management, strategies and way forward.

## 2. Results

The following are the results of the literature review as encompassed in the sub-headings for the review.

### 2.1. Describing the burden of DM and TB – globally and in India

#### 2.1.1. Epidemiology of TB

Among infectious diseases, mortality from TB continues to be high. In 2010, TB was the second leading cause of death from an infectious disease worldwide (after HIV which caused an estimated 1.8 million deaths in 2008).<sup>1</sup> There were an estimated 8.8 million incident cases of TB globally in 2010. Most of

the estimated number of incident TB cases occurred in Asia (59%) and Africa (26%) with India having the highest number (2.0 million–2.5 million), followed by China (0.9 million–1.2 million). Therefore, India alone accounted for an estimated one quarter (26%) of all TB cases worldwide. Of these 8.8 million TB cases, about 1.1 million (13%) were attributed to HIV. These statistics are alarming in spite of the fact that globally, the absolute number of incident TB cases per year has been falling since 2006 and the incidence rate (per 100 000 population) has been falling by 1.3% per year since 2002.<sup>4</sup>

As per the national tuberculin survey carried out in India from 2000 to 2003, the annual risk of TB infection (ARTI) was 1.5% and the incidence of new smear-positive TB cases was estimated as 75 new smear-positive cases per 100 000 population. The annual risk of infection was higher in urban areas (2.2%; 1.8%–2.6%; 95% Confidence Interval) than in rural areas (1.3%; 1.0%–1.5%) and higher in the north (1.9%; 1.3%–2.5%) and west (1.6%; 1.0%–2.2%) than in the east (1.3%; 1.0%–1.6%) and south (1.0%; 0.7%–1.4%).<sup>5</sup> As per reports, an estimated 40% of the Indian population is infected with TB bacillus. The prevalence of TB had been estimated at 3.8 million bacillary cases for the year 2000, by an expert group of Government of India. However the recent estimate by WHO gives a prevalence of 3 million.<sup>6</sup> As per 2009 data, the prevalence rate of all forms of TB in India was 249 per 100 000 population and the death rate (from all forms of TB excluding HIV) was estimated at 23 per 100 000 population.<sup>7</sup> On a national scale, the high burden of TB in India is illustrated by the estimate that TB accounts for 17.6% of deaths from communicable disease and for 3.5% of all causes of mortality (WHO, 2004). In 1997, India Revised National Tuberculosis Control Programme (RNTCP) on lines of the internationally recommended DOTS strategy. Since its inception, RNTCP has achieved a treatment success rate of >85% and has consistently managed to maintain the New Sputum Positive (NSP) case detection rate of >70%. As per the latest RNTCP status report (2011) the case fatality rate has remained less than 5% for new cases registered under the programme.

Management of TB/HIV co-infection has been widely understood to be an important factor in TB control. India is the third highest HIV burden country and TB is one of the commonly occurring opportunistic infections of HIV.<sup>7</sup> Thus, TB mortality could well be influenced by the TB/HIV co-infection, especially in the high HIV burden states of the country. It has been estimated that in 2007, about 4.85% of the incident TB cases in India were HIV-positive. Multi-drug resistance and extensive drug resistant cases add to the growing scourge of the disease. In absolute terms, in 2008, India had 99 000 (range 79 000–120 000) estimated cases of MDR-TB. A large scale population based survey in the state of Gujarat and Maharashtra has indicated multi-drug resistance levels of 3% among new TB cases and 12–17% among previously treated TB patients. High mortality from tuberculosis has serious socio-economic impact affected by high prevalence in the most productive age group of 15–54 years. Almost 70% of TB patients

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