



# Diabetes mellitus and smoking among tuberculosis patients in a tertiary care centre in Karnataka, India

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Diabetes mellitus (DM) and smoking are risk factors for adverse outcomes in the treatment of tuberculosis (TB). In a tertiary care hospital at Belgaum in the South Indian State of Karnataka, all TB patients aged  $\geq 18$  years consecutively diagnosed from February to September 2012 were evaluated for DM and smoking. Of 307 TB patients, 35.5% were found to have DM, 9.8% were current smokers, and 3.6% had DM and were also smokers. Measures to assess and address both these factors need to be taken into account during TB treatment.

**D**iabetes mellitus (DM) and tobacco smoking are independent risk factors for adverse tuberculosis (TB) treatment outcomes such as relapse, treatment failure and death.<sup>1,2</sup> Individuals with DM who smoke  $\geq 1$  pack of cigarettes daily are at particularly high risk of death from TB.<sup>3</sup> It has been recommended that TB patients should be routinely screened for both of these risk factors and that, if present, they should be addressed to improve TB treatment outcomes.<sup>3</sup>

India, with an annual incidence of 2.2 million TB cases, has the highest TB burden in the world.<sup>4</sup> Nearly 63 million people (~8% of the adult population aged  $\geq 20$  years) are estimated to have DM, and 120 million are estimated to be tobacco smokers (~14% of the adult population).<sup>5</sup> Previous studies have estimated the prevalence of diabetes and smoking among TB patients independently of each other, but none of these studies has screened for both conditions in the same setting and reported on the co-existence of both of these risk factors among TB patients.<sup>5</sup> These data will be useful to assess the extent of DM care and smoking cessation services required during the course of TB treatment. In this study we report the prevalence of impaired fasting glucose (IFG), DM and current smoking in a cohort of TB patients diagnosed at a medical college teaching hospital in the South Indian state of Karnataka.

## METHODS

### Study setting

KLES Dr Prabhakar Kore Hospital is a 2400-bed hospital in the Belgaum district of Karnataka State in South India. TB patients diagnosed in the hospital are sent from various departments to the DOTS centre for TB treatment.

### Study design, study population, screening procedures, recording and reporting

This was a cross-sectional study involving record review. All TB patients aged  $\geq 18$  years diagnosed

consecutively during the period February to September 2012 who were referred to the DOTS centre for TB treatment were included in the study. All eligible patients were asked about their history of DM. If there was no known history of DM, patients underwent random blood glucose (RBG) tests using a glucometer. Patients with RBG levels  $\geq 110$  mg/dl ( $>6.1$  mM) were requested to undergo a fasting blood glucose (FBG) test. Patients with FBG levels  $\geq 126$  mg/dl ( $\geq 7$  mM) and between 110 and 125 mg/dl (6.1–7.0 mM) were diagnosed with DM and IFG, respectively, and referred for diabetes care. Simultaneously, TB patients with a history of at least one episode of tobacco smoking in the last 3 months were identified as 'current smokers'. The procedure for screening, recording (in a separate register) and reporting (on a standard quarterly reporting form) has been described in detail elsewhere.<sup>6</sup>

### Data variables, data entry and analysis

The following data were extracted from the registers: age, sex, type of TB, RBG levels, FBG levels, and history of at least one episode of smoking in the last 3 months. The data were entered into a pre-structured data entry form created in EpiData Version 3.1 (EpiData Association, Odense, Denmark) and analysed. The data were summarised by frequencies and proportions.

### Ethics approval

This project protocol was reviewed and approved by the International Union Against Tuberculosis and Lung Disease Ethics Advisory Group.

## RESULTS

Of 307 patients referred to the DOTS centre, 247 (80.5%) underwent all appropriate blood glucose tests and screening for current smoking status. About two thirds (64.2%) were male. Overall, 7.8% of patients had IFG, 35.5% had DM, 9.8% were current smokers and 3.6% both had DM and were current smokers (Table). The prevalence of DM and smoking was higher among the younger age groups.

## DISCUSSION

Despite India's good Revised National TB Control Programme, DM and tobacco consumption have the potential to hamper TB control efforts. Research studies published recently in South India have found a high prevalence of DM among TB patients of approximately 25% in the State of Tamil Nadu and 44% in the State of Kerala.<sup>6–8</sup> These studies have shown that in addition

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### KEY WORDS

DM; TB; smoking; prevalence; India

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**TABLE** Prevalence of IFG, DM and smoking among a cohort of TB patients in Belgaum, India, January–September 2012

Characteristic	Total <i>n</i>	IFG <i>n</i> (%) <sup>*</sup>	DM only <i>n</i> (%) <sup>*</sup>	Smoking only <i>n</i> (%) <sup>*</sup>	DM + smoking <i>n</i> (%) <sup>*</sup>
Total	307	24 (7.8)	109 (35.5)	30 (9.8)	11 (3.6)
Age, years					
18–24	35	0	5 (14.3)	6 (17.1)	3 (8.6)
25–34	84	4 (4.8)	13 (15.5)	12 (14.3)	2 (2.4)
35–44	81	9 (11.1)	36 (44.4)	9 (11.1)	1 (1.2)
45–54	42	10 (23.8)	33 (78.6)	1 (2.4)	3 (7.1)
55–64	43	0	13 (30.2)	1 (2.3)	2 (4.7)
≥65	22	1 (4.6)	9 (40.9)	1 (4.6)	0
Sex					
Male	197	17 (8.6)	73 (37.1)	30 (15.2)	11 (5.6)
Female	110	7 (6.4)	36 (32.7)	0	0
Type of TB					
New smear-positive	160	8 (5.0)	57 (35.6)	14 (8.8)	5 (3.1)
New smear-negative	49	3 (6.1)	29 (59.2)	2 (4.1)	1 (2.0)
New extra-pulmonary	36	3 (8.3)	9 (25.0)	3 (8.3)	1 (4.2)
Retreatment cases	55	4 (7.3)	13 (23.6)	10 (18.2)	4 (7.3)
Multidrug-resistant TB (resistant to isoniazid and rifampicin)	7	6 (85.7)	1 (14.3)	1 (14.3)	0

<sup>\*</sup>Row percentages with denominator in Total column.  
IFG = impaired fasting glucose; DM = diabetes mellitus; TB = tuberculosis.

to DM, tobacco smoking needs to be addressed during TB treatment.<sup>9</sup> Of note, all of the current smokers in the study were male, highlighting the cultural tradition in this part of the country for women not to smoke.

Independent international guidelines exist for the management of co-morbid conditions, such as DM, tobacco smoking, human immunodeficiency virus infection, etc., among tuberculosis patients.<sup>10–12</sup> Depending on the local situation, national TB programmes in high TB burden countries need to adopt and incorporate these guidelines and integrate the implementation and monitoring of the management of co-morbidities. This must begin at least in the tertiary care centres, where the resources and expertise are available and, based on the experiences gained, implementation can then be extended to the peripheral health facilities.

The strength of this study is that we implemented and documented the screening of both factors within the routine hospital system, with no special budget allocated to support these activities. With nearly 80% of the TB patients successfully undergoing screening for both conditions, it appears that screening is feasible. About 20% were not screened, and the exact reasons were not clear. As our facility is a tertiary care centre with many specialised services, we were able to link patients with these co-morbidities to appropriate care. The limitations of the study were that 1) it was implemented in a tertiary care centre and the findings may not be generalisable, and 2) we defined a current smoker as anyone who had smoked at least one tobacco product within the last 3 months, and documented this status. In India, tobacco products are either chewed or smoked—both of which are equally dangerous to personal health—and the consumption pattern of these two forms of tobacco varies widely across the country. As we mentioned the integration of services,

we feel with hindsight that we should also have documented information on chewable forms of tobacco and used standardised definitions.

## CONCLUSIONS AND RECOMMENDATIONS

It is feasible to screen for DM and tobacco smoking among TB patients in tertiary care settings. We recommend that TB and DM clinics and smoking cessation services develop links towards an integrated, comprehensive package of services that could lead to improved care and better patient outcomes.

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Le diabète sucré (DM) et le tabagisme sont des facteurs de risque de mauvais résultats dans le traitement de la tuberculose (TB). Dans un hôpital de soins tertiaires à Belgaum dans l'Etat de Karnataka en Inde du Sud, tous les patients TB âgés de  $\geq 18$  ans et diagnostiqués consécutivement entre février et septembre 2012 ont été évalués en

La diabetes sacarina (DM) y el tabaquismo representan factores de riesgo de alcanzar desenlaces terapéuticos desfavorables en el tratamiento de la tuberculosis (TB). En un hospital de atención terciaria de Belgaum, en el estado de Karnataka del sur de la India, se investigaron el tabaquismo y la DM en todos los pacientes consecutivos de  $\geq 18$  años de edad, en quienes se estableció el diagnóstico de TB

matière de DM et de tabagisme. Sur 307 patients TB, on a trouvé un DM chez 35,5%, un tabagisme actuel chez 9,8% et chez 3,6%, à la fois un DM et un tabagisme actuel. Il est indispensable d'incorporer des mesures d'évaluation et de réaction à ces deux facteurs au cours du traitement de la TB.

entre febrero y septiembre del 2012. De los 307 pacientes TB, se diagnosticó DM en el 35,5%, el 9,8% eran fumadores actuales y el 3,6% eran diabéticos y fumadores actuales. Es necesario incorporar medidas de evaluación y de respuesta a estos dos factores durante el tratamiento de la TB.