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Low prevalence of diabetes mellitus in patients with tuberculosis in Cotonou, Benin

S. Ade,[1–3] D. Affolabi,[1] G. Agodokpessi,[1] P. Wachinou,[1] F. Faïhun,[1] N. Toundoh,[1] W. Békou,[1] A. Makpenon,[1] G. Ade,[1,2] S. Anagonou,[1] A. D. Harries[3,4]

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Setting: The three Basic Management Units (BMUs) of the National Tuberculosis Programme (NTP) in Cotonou, Benin.

Objective: To determine the prevalence of diabetes mellitus (DM) among tuberculosis (TB) patients in Cotonou.

Design: A cross-sectional study of consecutively registered TB patients treated for a minimum of 2 weeks between June and July 2014 in the three BMUs, with measurement of their fasting blood glucose (FBG). A patient was considered as having DM if venous FBG was ⩾7 mmol/l or if they reported a known history of DM.

Result: There were 159 patients assessed: 114 with new smear-positive pulmonary tuberculosis (PTB), 5 with new smear-negative PTB, 8 with extra-pulmonary TB, 21 retreatment patients with fully susceptible bacilli and 11 with multidrug-resistant TB. Of these, respectively 31 (19%), 18 (11%) and 10 (6%) were human immunodeficiency virus co-infected, smokers and hypertensive. Eight patients (5%) had impaired fasting glucose and three (1.9%) had DM (FBG ⩾ 7 mmol/l), of whom two were already known to have the disease and one was newly diagnosed.

Conclusion: DM may not be an important risk factor for TB in Cotonou. A larger study on TB and DM in the whole country is needed.

In recent decades, the world has been experiencing a new epidemic, characterised by an increase in the incidence and prevalence of diabetes mellitus (DM), a non-communicable disease (NCD). According to the International Diabetes Federation (IDF), globally there were an estimated 382 million persons with DM in 2013, of whom 19.8 million lived in sub-Saharan Africa. Furthermore, it is predicted that the number of DM cases globally will rise to 592 million by 2035, more than doubling in sub-Saharan Africa. Nearly 5 million people are estimated to die globally from DM each year, the equivalent of one person dying every six seconds.[1,2]

Persons with DM can experience many types of complications, of which infectious diseases, including tuberculosis (TB), are common. The association between DM and TB has been documented for many years, with a 2008 systematic review indicating that DM can increase the risk of active TB by a factor of two to three times compared to patients without DM.[3] According to recent World Health Organization (WHO) estimates, the number of adult TB cases associated with DM is just over 1 million, almost the same as the number of TB cases associated with the human immunodeficiency virus (HIV). It is thought that the rising burden of DM may adversely affect TB control and reverse the downward trend in TB incidence seen in the last 10 years.[4]

To tackle this dual burden of disease, a collaborative framework has been launched by the WHO and the International Union Against Tuberculosis and Lung Disease (The Union), which emphasises the need to establish collaborative mechanisms between national TB programmes (NTPs) and diabetes organisations and the bi-directional screening of TB and DM.[5]

Benin is a small country in West Africa with a stable TB notification rate of between 39 and 41 per 100 000 population and a DM prevalence in adults of 2.6% in 2008.[6,7] In Cotonou, the economic centre of Benin, where the majority of TB cases in the country are notified, the prevalence of DM rose from 3.3% in 2002 to 4.7% 5 years later.[8] To date, there has been no formal collaboration between the NTP and diabetes organisations in the country and there is little information on the association between TB and DM. A study was therefore undertaken in Cotonou to determine the prevalence of DM among TB patients.

METHODS

Study design

This was a cross-sectional study involving patients diagnosed and treated for TB in Cotonou.

General setting and study site

Country

Benin is a low-income West African country with a population of 9 983 884, of whom approximately 678 874 live in Cotonou, the main city.[9] In 2012, the national gross domestic product was estimated at US$7557 billion (http://data.worldbank.org/about/countryclassifications).

Tuberculosis control

The NTP follows the DOTS strategy and uses recognised international criteria for TB diagnosis and treatment.[10]

In Cotonou, TB care is managed in three Basic Management Units (BMUs): the Centre National Hospitalier de Pneumo-phtisiologie (CNHPP), and the Bethesda and Saint-Luc hospitals, which notified respectively 85%, 10% and 5% of TB cases in the city in 2013. TB patients are not systematically screened for DM at the time of treatment initiation.

AFFILIATIONS
1 National Tuberculosis Programme, Cotonou, Benin
2 Service de Médecine Interne, Centre National Hospitalier Universitaire Hubert Koutoukou Maga, Cotonou, Benin
3 International Union Against Tuberculosis and Lung Disease, Paris, France
4 London School of Hygiene & Tropical Medicine, London, UK

CORRESPONDENCE
Serge Ade
National Tuberculosis Programme
BP321
Cotonou, Benin
Tel: (+229) 9654 5760
e-mail: adeserg@yahoo.fr

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KEY WORDS
diabetes mellitus; tuberculosis; noncommunicable diseases; Benin; operational research

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Diabetes mellitus management

DM is usually managed in public and private hospitals or by non-governmental organisations (NGOs) involved in health care in the country. In Cotonou, DM patients are mainly offered care by specialists in the referral and teaching hospital and in an NGO centre, and to a lesser extent by general medical doctors. In 2007, an NCD Programme was initiated by the Ministry of Health. To date, this programme has focused on preventing NCD risk factors such as tobacco use, unhealthy diet, lack of physical activity, harmful use of alcohol and hyperglycaemia. Patients with DM are not systematically screened for TB at the time of DM diagnosis or at regular follow-up intervals. However, those with symptoms suggestive of TB are managed according to the NTP guidelines in the BMUs.

Patients

In June and July 2014, TB patients who had been undergoing anti-tuberculosis treatment in Cotonou for a minimum of 2 weeks were consecutively enrolled for blood glucose screening. Patients undergoing treatment for ⩾2 weeks were selected to reduce the confounding influence of transient hyperglycaemia experienced by some TB patients at the start of their illness as a result of the stress imposed on the body by a chronic infectious disease.[11]

Data variables, definitions of variables, source of data and data collection tool

The data variables included epidemiological and clinical characteristics, types of TB, other co-morbidities (HIV infection, hypertension, smoking, obesity) and capillary fasting blood glucose (FBG) measurements followed by morning venous FBG measurements for patients with capillary FBG ⩾6.1 mmol/l. The definitions used are those recommended by the WHO and/or the IDF:[12–15]

- DM: venous FBG ⩾ 7 mmol/l or if patients reported a known history of DM
- Impaired fasting glucose (IFG): FBG between 6.1 and 6.9 mmol/l
- Hypertension: blood pressure >140/90 mmHg
- Smoker: a person who states that he/she smoked any tobacco product either daily or occasionally at the time of TB diagnosis
- Obesity: body mass index ⩾30 kg/m^2.

Data were collected in November 2014 from patient medical files, TB registers and laboratory registers and exported to a paper-based study questionnaire.

Analysis and statistics

The data from the questionnaire were double entered into EpiData version 3.1 (EpiData Association, Odense, Denmark), and analysed using frequencies and percentages.

Ethics

This study was approved by the Ethics Advisory Group of The Union, Paris, France, and the management team of the NTP, Cotonou, Benin.

RESULTS

There were 159 patients with TB: respectively 114, 28 and 17 cases from the CNHPP, Bethesda and Saint-Luc hospitals. Of these, there were 114 patients with new smear-positive pulmonary TB (PTB), 5 with new smear-negative PTB, 8 with extra-pulmonary TB (EPTB), 21 retreatment cases with fully susceptible bacilli and 11 with multidrug-resistant TB (MDR-TB). There were 99 males (62%) and the median age (interquartile range) was 32 (25–42) years. Of these, 31 (19%), 18 (11%) and 10 (6%), respectively, were HIV co-infected, smokers and hypertensive. Eight patients (5%) had IFG and 3 (1.9%) (aged respectively 35, 60 and 65 years) had DM, of whom two were already known to have the disease and were on treatment and one was newly diagnosed. All of the DM-TB patients were hypertensive and one was obese.

DISCUSSION

The main finding of this study was a low prevalence of DM among TB patients in Cotonou. The prevalence was lower than that observed in the general population, suggesting that DM may not be an important risk factor for developing TB in this setting.[8] This lack of association may be explained by the high burden of TB among younger people, who in general have a lower incidence of DM than those aged ⩾45 years.[7] The fact that two of the three patients diagnosed with DM-TB in this study were aged ⩾60 years supports this theory. This finding is also in line with reports from other countries.[16,17] It is possible that the proportion of TB patients with DM in other regions of the country is different from that in Cotonou, as the prevalence rates of DM differ in the general population; this requires further assessment at some stage.

The strengths of this study, which to our knowledge is the first in Benin, are that consecutive patients with TB were screened, with blood glucose assessed at least 2 weeks after the start of anti-tuberculosis treatment. The limitations lie in the fact that the study was confined to patients from Cotonou, making it difficult to generalise the results to the whole population.

Despite these limitations, this study has several implications for the Benin NTP. First, despite the low prevalence of DM in TB patients, we would recommend systematic screening for DM in older TB patients, as the combination of TB with DM leads to worse treatment outcomes, with a higher risk of death and relapse among these patients.[18,19] Second, this study shows that TB patients may have other NCD risk factors, including hypertension and smoking, and TB treatment may provide an opportunity to screen such patients and advise them on prevention and cessation. Third, there is a need for a similar assessment nationwide to determine the prevalence of TB among DM patients in diabetes clinics or cohorts. Finally, we encourage the strengthening of relations between NTPs and diabetes organisations.

In conclusion, the prevalence of DM among TB patients in Cotonou was low. A larger study on DM-TB in the whole of the country is needed.

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Cadre : Les trois Centres de Dépistage et de Traitement de la Tuberculose (TB) de Cotonou, Bénin.
Objectif : Déterminer la prévalence du diabète sucré (DM) parmi les patients tuberculeux à Cotonou.
Méthode : Etude transversale avec enrôlement successif de tous les patients tuberculeux traités depuis au moins 2 semaines entre juin et juillet 2014, et mesure de leur glycémie à jeun. Le diagnostic de DM était retenu sur la base d'une glycémie veineuse à jeun ⩾ 7 mmol/l ou d'un antécédent de DM rapporté par le patient.
Résultat : Au total, 159 patients étaient inclus : 114 nouveaux cas de TB pulmonaire à microscopie positive, 5 nouveaux cas de TB pulmonaire à microscopie négative, 8 cas de TB extrapulmonaire, 21 cas de retraitement à germes sensibles et 11 cas de TB multirésistante. D'eux, respectivement 31 (19%), 18 (11%) et 10 (6%) étaient co-infectés, fumeurs et hypertendus. Il y avait huit patients (5%) intolérants au glucose et trois (1.9%) diabétiques, dont un nouvellement diagnostiqué.
Conclusion : A Cotonou, le DM ne semble pas être un facteur de risque majeur de développement d'une TB-maladie. Une étude à l'échelle nationale s'avère nécessaire pour cerner l'ampleur de cette affection parmi les tuberculeux dans tout le pays.

Marco de referencia: Las tres Unidades Básicas de Tratamiento en el Programa Nacional contra la Tuberculosis de Beni, en Cotonou.
Objetivo: Determinar la prevalencia de diabetes (DM) en los pacientes con diagnóstico de tuberculosis (TB) en Cotonou.
Método: Fue este un estudio transversal de los pacientes registrados de manera consecutiva y que recibieron tratamiento como mínimo durante 2 semanas, de junio a julio del 2014, en las Unidades Básicas de Tratamiento, a quienes se practicó una glucemia plasmática en ayunas. Se definió el diagnóstico de DM como una glucemia en ayunas ⩾ 126 mg/dl (o 7 mmol/l) o la referencia por el paciente de un diagnóstico conocido de DM.
Resultados: Se evaluaron 159 pacientes, de los cuales 114 casos nuevos de TB pulmonar con baciloscopia positiva, 5 casos con baciloscopia negativa, 8 casos de TB extrapulmonar, 21 casos en retratamiento antituberculoso con bacilos normosensibles y 11 casos de TB multidrogorresistente. De estos pacientes, 31 presentaron coinfección por el virus de la inmunodeficiencia humana (19%), 18 eran fumadores (11%) y 10 eran hipertensos (6%). Se detectaron ocho pacientes con una glucemia basal alterada (5%) y tres con DM (1,9%), de los cuales dos ya conocían el diagnóstico.
Conclusión: Al parecer la DM no constituye un factor mayor de riesgo de contraer la TB en Cotonou. Es necesario llevar a cabo un estudio más amplio a escala nacional sobre ambas enfermedades.

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