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Important co-morbidity in patients with diabetes mellitus in three clinics in Western Kenya

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Setting: Diabetes clinics in three hospitals in Western Kenya: Moi Teaching and Referral Hospital and two associated district hospitals.
Objective: To determine the proportion of diabetes patients with a history of tuberculosis (TB), human immunodeficiency virus (HIV) infection and tobacco smoking.
Design: A descriptive study using routinely collected data from patient records in the three diabetes clinics.
Results: Of 1376 patients analyzed, 750 (55%) were female. The mean age of the patients in the clinics was 53.5 years (95%CI 52.2–54.8), with an average duration of diabetes of 8.1 years (95%CI 7.6–8.7). Of all patients, 5.6% reported a history of TB, similar to the frequency about 20 years earlier (1990) in Tanzania. Only 30% of the patients reported knowing their HIV status; 6% were HIV-positive. A history of tobacco smoking was reported by 3.8% of the patients.
Conclusion: The HIV epidemic does not seem to have significantly changed the relationship between TB and diabetes mellitus (DM) in this cohort of diabetes patients. The frequency of HIV and TB in this special population was comparable to that in the general population, and only a small proportion of patients reported a history of tobacco smoking.

In three diabetes clinics in Western Kenya, a number of patients reported having a cough. Cough can be due to heart failure, chest infections, or the adverse effect of medications (angiotensin converting enzyme inhibitors) used in the management of diabetes mellitus (DM). More importantly, cough can be a marker for pulmonary tuberculosis (TB), a disease that is common in Kenya.[1]

There is a strong association between TB and DM, with an estimated relative risk of 3.1 (95% confidence interval [CI] 2.3–4.3) in one systematic review.[2] Few of the studies in the review were carried out in low-income countries, and none in Africa. This raises uncertainties about the strength of the DM-TB association in these settings, and critical questions remain unanswered.[3] In sub-Saharan Africa, there have only been three studies on the co-morbidity of DM and TB. All were performed in Tanzania: two in 1990, one of which evaluated TB in patients with DM[4] and the other DM in patients with TB;[5] and the third in 2011, which evaluated DM in patients with TB.[6]

The human immunodeficiency virus (HIV) epidemic that emerged in the late 1980s significantly increased the overall incidence of TB in countries in sub-Saharan Africa, including Kenya.[7] This study therefore sought to assess whether the frequency of TB in patients with diabetes would also have changed during that time. There is also a well-known association between tobacco smoking and TB,[8] and in addition, smoking is a risk factor for co-morbidities in patients with DM. There is thus a knowledge gap on the current frequency of TB in patients with DM in the presence of HIV infection and tobacco smoking in sub-Saharan Africa.

Given this gap and the large cohort of patients with DM treated in our clinics, we set out to determine the proportion of these patients with 1) a history of TB, 2) HIV infection and 3) tobacco smoking.

METHODS

Design

This was a descriptive study using routinely collected patient data from records in three out-patient diabetes clinics in Western Kenya.

Setting

This study was performed in a region with a high prevalence of HIV and TB. A recent rise in diabetes cases led to the establishment of diabetes clinics to care for these patients.[9] The study included all the patients in the diabetes clinics in three hospitals in Western Kenya: Moi Teaching and Referral Hospital (MTRH) and two associated district hospitals, Webuye District Hospital (WDH) and Kitale District Hospital (KDH). MTRH is the second largest referral hospital in Kenya and serves the western region of Kenya. It serves both the urban population of Eldoret town, in which it is located, and the rural population of the surrounding region, as well as referral cases. WDH serves primarily a rural agricultural population, while KDH serves a peri-urban population.

Diabetes management

Patients in the three DM clinics were referred for diabetes care from a variety of sources: medical wards, medical out-patient clinics, health centers, dispensaries and community health workers. Clinical care was standardized across the three clinics. A standardized initial encounter form captured relevant information on enrollment: clinical, demographic, social and economic, including birth date, history of TB, HIV, cardiovascular disease and smoking. Standardized return visit forms were used during follow-up clinic visits to document vital signs, weight, height, random

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blood sugar/fasting blood sugar, glycated hemoglobin (HbA1c), symptoms, clinical findings and medications prescribed during the visit. At the end of the patient encounter, the data were entered into an Access (Microsoft Corp, Redmond, WA, USA) database by trained staff.

Participants

The participants in this study were all patients with DM enrolled in the three clinics from January 2007 to February 2011, for whom information was available from the diabetes databases at the DM clinics.

Variables

A TB case was defined as a patient who had TB recorded in the DM clinic register, based on self-report. From these patients, we identified those in whom TB was diagnosed at or after the diagnosis of DM. HIV status was based on self-report as recorded in the register. A smoker was defined as a patient who reported ever having smoked any form of tobacco.

Data collection

Data from the Microsoft Access database were collected by the data manager. Variables included: age, sex, history of tuberculosis, date/year of DM diagnosis, HIV status and smoking history. Data were double-entered into EpiData (EpiData Association, Odense, Denmark) and validated.

Analysis

Data analysis using EpiData software included *t*-test, χ^2 test or Fisher's exact test; $P < 0.05$ was considered statistically significant.

Ethics approval

The study was approved by the Moi Teaching and Referral Hospital/Moi University School of Medicine Institutional Research and Ethics Committee and the Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease, Paris, France.

RESULTS

Of 1519 patient records extracted from the database, 143 (9%) were excluded due to missing data. Data for 1376 patients were analyzed, of whom 750 (55%) were female. The mean age of the patients was 53.5 years (95%CI 52.2–54.8), with an average duration of diabetes of 8.1 years (95%CI 7.6–8.7). The mean body mass index (BMI) was 26.8 (95%CI 26.3–27.3). At least one HbA1c result was available for 655 (48%) patients (average 10.5%, 95%CI 10.2–10.8), of whom 100 (15%) had HbA1c < 7%. Of the 1376 patients, 652 (47%) were on oral hypoglycemic agents and 495 (36%) on insulin. The remaining 229 patients (17%) had no treatment recorded in their charts, perhaps because they were not on treatment, or because it was omitted from their records. As this was a retrospective study, we were unable to determine the reasons.

Of the 77 (5.6%) patients who reported a history of TB, 44 were diagnosed with TB after being diagnosed with DM. The only difference between patients with and those without TB was that a higher proportion of men (61%) than women (44%) had TB. There was no difference based on age, BMI, history of tobacco smoking or alcohol intake, type of diabetes medication or HbA1c level.

Only 414 (30%) patients reported knowing their HIV status; of these, 25 (6%) were HIV-positive. Of the 44 patients who were diagnosed with TB after DM, 29 knew their HIV status; 5 (17%) were HIV-positive.

Fifty-two (3.8%) patients reported a history of tobacco smoking; only one of these had a past history of TB.

DISCUSSION

This is the first study in sub-Saharan Africa in 22 years to describe TB in diabetes patients. In addition, it reflects the emergence of DM clinics in response to a rising tide of DM and the presence of important co-morbidities, including TB (DM is a risk factor for TB), HIV (which is a prevalent health risk in these communities and a promoter of TB), and smoking. In this study in Western Kenya, 5.6% of the patients reported a history of TB, and only 30% of the patients knew their HIV status. In addition, we found a very low rate of tobacco smoking.

This study revealed new information about diabetes management in Kenya. Patients had been on treatment for an average of 8 years, with HbA1c levels and BMI remaining higher than accepted international targets.[10] However, these results are similar to those in many other countries in sub-Saharan Africa, where patients receive less than optimal care for their diabetes.[11,12] Despite the generally poor diabetes control in this population, a third of our patients were on insulin therapy, and our clinics used HbA1c testing, indicating reasonable access to diabetes management tools.

In a setting with high HIV and TB prevalence, the co-morbidity of these infectious diseases in patients with DM is to be expected. Only a small proportion of this diabetic population had a past history of TB. These results may not reflect the true burden of TB in DM due to the retrospective nature of the study and the stigma associated with TB in the past due to its association with HIV. In 1990, Swai et al. showed a 5.4% incidence of TB in Tanzania in a 7-year follow-up of 1250 diabetic patients.[4] Even though the true rate of TB might be higher, TB should be considered as an important co-morbidity of DM in this setting. The low rate of TB in this study does not support a policy of routine laboratory screening for TB, although patients presenting with symptoms compatible with TB should be investigated.

HIV is still an important public health issue in Kenya. In our study, the proportion of patients who knew their HIV status, and were HIV-positive, was comparable to rates in the general Kenyan population.[13] However, the proportion of patients with a history of TB and who were HIV-positive was substantially higher (17%). This higher proportion could have been due to the fact that TB patients were more likely to have been tested for HIV at the TB clinics.[14] Patients are not systematically offered HIV testing in DM clinics, and only

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Conflict of interest: none declared.

30% of the DM patients studied knew their HIV status. The DM clinic patients had an average age of >50 years, and their only contact with the health care system may have been the DM clinic, where HIV was not routinely tested. HIV screening, one of the principal strategies for the control of the HIV epidemic, should therefore be offered to all patients in the diabetes clinics and other chronic disease clinics in our setting.

Tobacco smoking has been recognized as a major health problem in many settings worldwide. In 2004, a tobacco survey showed that 13.7% of adults in Kenya aged >18 years reported smoking tobacco (unpublished report). In this study, a relatively small proportion of patients, 3.8%, were tobacco smokers. We suggest this could be due to the cost of tobacco products, which may have been a deterrent to smoking among patients with many financial obligations and limited resources. Furthermore, many patients in the rural setting chew and sniff tobacco, and no data on these forms of tobacco use were collected in the clinics.

The strengths of this study are that it is a cross-sectional look at the co-morbidity of TB, HIV and tobacco smoking in a new, emerging set of clinics caring for patients with DM. The study sample was large, and included all patients registered in the clinics over a 4-year period. It was also carried out under routine program conditions, and thus likely reflected the situation in chronic disease clinics in Western Kenya. Finally, the study adhered to Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.[15]

The study had several limitations. One was the use of routine clinic data, which may have been inaccurate or had missing elements. However, only a small percentage of the clinic charts (9%) had to be excluded due to missing data. In addition, the study relied on recall of history of TB and HIV status, which may have been inaccurate. Although it is highly unlikely for a patient to forget a previous episode of TB, there could have been reporting bias (denial) due to associated stigma. TB has been associated with HIV in many clinical settings, and patients with DM may have declined to disclose a history of TB due to its association with HIV. In particular, patients could have inaccurately recalled the timing of diagnosis of TB and the timing of the onset of their diabetes. This could have led to an underestimation of the burden of TB attributable to DM. The poor diabetes control in this population could explain the failure to detect an association between TB and poor DM control, i.e., there were insufficient patients with good control to act as a comparison group for poor DM control as a risk factor for TB.

CONCLUSION

The rising prevalence of patients with DM in communities with a high prevalence of TB and HIV is bound to increase the co-morbidity of these diseases and present new challenges for clinicians in sub-Saharan Africa. Further prospective studies are therefore necessary to better describe the co-morbidity between the two common infectious diseases, HIV and TB, with DM in our population. The frequency of HIV and TB in this cohort was comparable to that in the general population, with only a small proportion of patients reporting a history of tobacco smoking.

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Contexte : Les polycliniques du diabète dans trois hôpitaux de l'Ouest du Kenya : Moi Teaching et Referral Hospital et deux hôpitaux de district associés.
Objectif : Déterminer la proportion de patients diabétiques ayant des antécédents de tuberculose (TB), d'infection par le virus de l'immunodéficience humaine (VIH) et de tabagisme.
Schéma : Etude descriptive utilisant les données colligées en routine dans les dossiers des patients dans les trois polycliniques du diabète.
Résultats : On a analysé 1376 patients, parmi lesquelles 750 femmes (55%). L'âge moyen des patients dans les polycliniques a été de 53,5 années (IC95% 52,2–54,8), avec une durée moyenne du diabète de 8,1 années (7,6–8,7). Sur l'ensemble des patients, 5,6% ont signalé des antécédents de TB, fréquence similaire à celle existant 20 ans plus tôt (1990) en Tanzanie. Seulement 30% des patients ont signalé connaître leur statut VIH et 6% ont été séropositifs pour le VIH. Des antécédents de tabagisme ont été signalés par 3,8% des patients.
Conclusion : L'épidémie de VIH ne semble pas avoir modifié de manière significative les relations entre la TB et le diabète dans cette cohorte de patients diabétiques. La fréquence du VIH et de la TB dans cette population spécifique est comparable à celle observée dans la population générale ; une proportion faible seulement de patients signale des antécédents de tabagisme.

Marco de referencia: Los consultorios de atención de la diabetes en los siguientes hospitales de Kenia occidental: el Moi Teaching and Referral Hospital y dos hospitales distritales adjuntos.
Objetivo: Determinar la proporción de pacientes diabéticos que presentaban antecedentes de tuberculosis (TB), infección por el virus de la inmunodeficiencia humana (VIH) o tabaquismo.
Método: Un estudio descriptivo a partir de los datos recogidos de manera sistemática en las historias clínicas de los pacientes en tres consultorios de atención de la diabetes.
Resultados: Se analizaron las historias clínicas de 1376 pacientes, de los cuales 750 fueron de sexo femenino (55%). El promedio de edad de los pacientes fue de 53,5 años (IC95% 52,2–54,8) y el promedio de evolución de la diabetes fue 8,1 años (IC95% 7,6–8,7). El 5,6% de los pacientes refirió antecedentes de TB, lo cual corresponde a la frecuencia registrada 20 años atrás (1990) en Tanzania. Solo el 30% de los pacientes refirió conocer su estado con respecto al VIH y el 6% presentaba un examen serológico positivo. Un 3,8% de pacientes refirió antecedentes de tabaquismo.
Conclusión: La epidemia de infección por el VIH no parece haber cambiado de manera significativa la relación entre la TB y la diabetes sacarina en esta cohorte de pacientes diabéticos. La frecuencia de infección por el VIH y de TB en esta población específica fue equivalente a la frecuencia en la población general y solo una pequeña proporción de pacientes refirió antecedentes de tabaquismo.

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