Prevalence of diabetes mellitus among pulmonary tuberculosis suspects in Nnewi, Nigeria

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ABSTRACT

To determine the prevalence of diabetes mellitus among pulmonary tuberculosis patients in Nnewi Nigeria. This was a prospective study in which pulmonary tuberculosis patients were tested for diabetes. Fasting blood glucose concentration was determined by the glucose oxidase method and diabetes diagnosed if fasting glucose concentration was >126mg/dl. Data generated were analyzed using chi-square test. The prevalence of diabetes mellitus among pulmonary tuberculosis patients was 38%. Majority of the DM/PTB coinfected patients were males, in the age group 25-34 years. The proportion of patients who were not aware of their diabetes status until enrollment was 32%. The prevalence of diabetes mellitus was 12.2%. Females were more diabetic than males (p=0.74). The prevalence of pulmonary tuberculosis was 9.8%. Males and the age group 25-34 year were mostly infected with tuberculosis. The prevalence of diabetes mellitus among pulmonary tuberculosis patients in Nnewi was high. It is important to screen all pulmonary tuberculosis suspects for diabetes and vice-versa to detect prevailing undiagnosed diabetes particularly among young males.

Keywords: Pulmonary Tuberculosis, Diabetes Mellitus, Prevalence, Diagnosis

INTRODUCTION

The association between diabetes mellitus and pulmonary tuberculosis has been recognized for centuries [1]. In the last decades, this link has re-emerged because of epidemic growth of diabetes. The epidemic growth of diabetes mellitus occurs in developing countries where tuberculosis is highly endemic [1]. The total number of people with diabetes mellitus worldwide is projected to rise from 285 million in 2010 to 439 million in 2030 [2]. This incidence is mainly driven by changes in diet and levels of physical activity and lifestyles [3]. Pulmonary tuberculosis on the other hand remains the disease with the highest global mortality for a single infectious agent [4]. Nigeria is ranked the 11th among the world’s 22 high-burden tuberculosis countries [5]. Diabetes mellitus increases the risk of progression from latent tuberculosis infection to active tuberculosis disease and complicates the treatment of active tuberculosis as it is hard to treat an infection in the face of poor glycaemic control [6]. Studies show that 5-30% of patients with tuberculosis present with concomitant diabetes mellitus [1,7].

It has previously been reported [8] that tuberculosis treatment reduced the effectiveness and concentration of diabetes medications which makes it difficult to control diabetes. In the setting of the increasing overlap of populations at risk for both diseases, the combination of tuberculosis and diabetes mellitus present a worldwide health threat.
MATERIALS AND METHODS

Study area
The study was carried out at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Nigeria. NAUTH, Nnewi is a tertiary hospital which serves as referral centre for other hospitals. Nnewi is located at longitude 6.92°E and latitude 6.03°N.

Subjects
Individuals 15 years of age and above suspected of pulmonary tuberculosis (PTB) (cough ≥ 3 weeks) who presented to the TB (DOTS) clinic during the data collection period were included. Participation was voluntary and a written consent was signed. A total of 871 people enrolled. Ethical approval was obtained from the hospitals ethical committee.

Sampling
The sample size for the study was determined using a single population proportion formula

\[ n = \left( \frac{Z}{d} \right)^2 P (1 - P) \]

Where
- \( n \) = required sample size
- \( Z \) = reliable coefficient (1.96)
- \( P \) = estimated prevalence of DM among patients with TB (27%)
- \( d \) = absolute estimated precision error required on either side of proportion (0.03)

Accordingly, the calculated final sample size of 841 was raised to 871 to increase the statistical power of the sample.

Methods
Diagnosis for smear positive PTB among suspects were carried out based on the National Tuberculosis Diagnosis Guideline. Two sputum samples (spot-morning) were collected, smeared and stained using the Ziehl-Neelsen staining method. The stained smears were read using x100 oil immersion objective and graded according to the WHO/IUATLD System (2010). As a quality control method, the entire positive and fifty percent of the negative slides were re-read by experienced laboratory scientists blind for smear confirmation. PTB was diagnosed if at least 1 smear result was positive for acid fast Bacilli (AFB).

Data analysis
Data generated was analyzed using Chi square test. Results were considered statistically significant at \( P<0.05 \)

RESULTS

A total of 871 pulmonary tuberculosis suspects participated in the study. Among 85 pulmonary tuberculosis patients, diabetes was found in 32 patients. The prevalence of diabetes mellitus among pulmonary tuberculosis patients was 38%. Males were more infected than females (fig1 and 2).
Majority of the DM/PTB coinfected patients were in the age group 25-34 years. (fig3).
The prevalence of diabetes mellitus was 12.2%. Females (58%) were more diabetic (p=0.74), than males (42%) (Table 1).

<table>
<thead>
<tr>
<th>Age group (yr)</th>
<th>Total screened</th>
<th>Males Pos (%)</th>
<th>Females Pos (%)</th>
<th>Total DM + (%)</th>
<th>Total DM - (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>122</td>
<td>3(6.6)</td>
<td>2(3)</td>
<td>5(4.7)</td>
<td>117(15)</td>
</tr>
<tr>
<td>25-34</td>
<td>209</td>
<td>8(17.8)</td>
<td>11(18)</td>
<td>19(18)</td>
<td>190(25)</td>
</tr>
<tr>
<td>35-44</td>
<td>236</td>
<td>14(31)</td>
<td>18(30)</td>
<td>32(30)</td>
<td>204(27)</td>
</tr>
<tr>
<td>45-54</td>
<td>158</td>
<td>14(31)</td>
<td>15(25)</td>
<td>29(27)</td>
<td>129(17)</td>
</tr>
<tr>
<td>55-64</td>
<td>81</td>
<td>3(6.6)</td>
<td>7(11)</td>
<td>10(9.4)</td>
<td>71(9)</td>
</tr>
<tr>
<td>65 &amp; above</td>
<td>65</td>
<td>3(6.6)</td>
<td>8(13)</td>
<td>11(10.4)</td>
<td>54(7)</td>
</tr>
<tr>
<td>Total</td>
<td>871</td>
<td>45(42)</td>
<td>61(58)</td>
<td>106(12.2)</td>
<td>765(87.8)</td>
</tr>
</tbody>
</table>

Out of 106 diabetic patients, 34(32%) respondents were diagnosed of diabetes for the first time. Pulmonary tuberculosis prevalence rate of 9.8% was observed. The age group 25-34 years was mostly infected as well as males than females (fig4)

**DISCUSSION**

Pulmonary tuberculosis and diabetes mellitus are two diseases of immense public health significance. Various studies have established an association between the two conditions. In this study, the prevalence of diabetes mellitus among pulmonary tuberculosis patients was 38%. Our finding was similar to the data of Restrepo et al [2] who reported a prevalence of diabetes mellitus among pulmonary tuberculosis patients of 39% in Texas and 36% in Mexico. In India, a prevalence of 44% had been reported [7]. Previous literature supports that diabetes mellitus is an important risk factor for the development of pulmonary tuberculosis [10]. The majority of DM/PTB coinfected patients were males in the young age group of 25-34 years. A previous study [11] had reported a higher risk among younger non North Americans and Europeans with a high background of tuberculosis incidence. Our study demonstrated that a significant proportion of new cases of diabetes (32%) was detected by carrying out active screening for diabetes in patients with pulmonary tuberculosis. The data of Kibrigie et al [12] had similarly shown that only 5 (1.9%) of 260 confirmed tuberculosis patients in Uganda had a known diagnosis of diabetes mellitus at enrollment. Balakrishnan et al [7] reported 21% previously undiagnosed diabetes mellitus among tuberculosis patients in India. This our finding is alarming. The high proportion of undiagnosed diabetes mellitus cases may indicate less awareness of diabetes mellitus by the public and/or lack of access to healthcare services for the
diagnosis of diabetes. Since diabetes may increase the risk of adverse treatment outcome in tuberculosis patients, special attention is needed to ensure high quality tuberculosis treatment in people with diabetes.

The prevalence of diabetes mellitus was 12.2% and females were more diabetic than males. The data of Chukwu et al [13] supports this finding.

Majority of the pulmonary tuberculosis patients were in the age group 25-34 years. This confirms the fact that young adults were the most infected. It is interesting because the same age group were mostly coinfected with DM/TB. The Nation’s economy could be adversely affected.

CONCLUSION

The prevalence of diabetes mellitus among pulmonary tuberculosis patients in Nnewi was high. A high proportion of the diabetic cases were undiagnosed until enrollment. Young adults were mostly infected with diabetes and tuberculosis.

We therefore recommend that screening for diabetes among pulmonary tuberculosis patients and vice-versa be made mandatory to identify prevailing undiagnosed diabetes.

REFERENCES