Diabetes reduces the rate of sputum culture conversion in patients with newly diagnosed multidrug resistant tuberculosis

Argita Salindri, Maia Kipiani, Russell Kempler, Neel Gandhi, Lasha Darchia, Nestani Tukvadze, Henry Blumberg, Matthew Magee

School of Public Health, Georgia State University, Atlanta, USA
National Center for Tuberculosis and Lung Diseases, Tbilisi, Republic of Georgia
Emory University School of Medicine, Atlanta, USA
Emory University Rollins School of Public Health, Public Health, Atlanta, USA

INTRODUCTION

Definitions:
- Primary Exposure: Diabetes determined by Hba1c level
- Primary Outcome: Drug resistance profile: primary MDR TB defined as a MDR TB case with no prior history of TB treatment
- Classification of drug resistance profile: a. Fully susceptible: TB that was susceptible to all first-line anti-TB drugs
  b. Any Resistance: TB resistant to at least one first line TB drug but not MDR TB or XDR TB
  c. MDR TB: TB resistance to at least rifampin and isoniazid
  d. XDR TB: MDR TB with additional resistance to any fluorquinolone and at least one of three injectable second-line drugs

METHODS

Study Design:
- Prospective cohort study conducted from 2011 to 2014
- Part of the Hemoglobin A1c Levels among tuberculosis patients in Tbilisi (HALT study)

Setting:
- National Center for TB and Lung Disease (NCTLD), Tbilisi, Country of Georgia

Inclusion criteria: Age ≥35
- Confirmed new pulmonary TB case

Exclusion criteria: Patients with previous history of TB treatment
- Retreatment MDR TB cases
- Patients with missing DST results

RESULTS

• 268 newly diagnosed TB patients with available DST results were included in the final analysis
• MDR TB prevalence was 19.4% and diabetes prevalence was 13.4%.
• Among patients with MDR TB, the prevalence of diabetes was 21.2%.
• Almost all of MDR TB patients were converted to negative (84.6%) with median culture conversion time of 62 days (IQR 32 – 94).

RESULTS

Figure 1. Adjusted odds ratios for any drug resistance and M/XDR among patients with newly diagnosed TB in Tbilisi, Georgia, N=268

Table 1. Baseline characteristics and drug resistance profile.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Converted</th>
<th>Median (IQR)</th>
<th>crHR (95% CI)</th>
<th>aHR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>No</td>
<td>34/41 (82.9%)</td>
<td>0.7 (0.5–1.0)</td>
<td>0.6 (0.5–1.0)</td>
</tr>
<tr>
<td>Yes</td>
<td>10/11 (90.9%)</td>
<td>1.0 (0.6–1.7)</td>
<td>1.0 (0.6–1.7)</td>
<td></td>
</tr>
<tr>
<td>Household Income 559 (72)</td>
<td>22/32 (68.8%)</td>
<td>1.0 (0.8–1.2)</td>
<td>1.0 (0.8–1.2)</td>
<td></td>
</tr>
<tr>
<td>$500 – $175</td>
<td>12/14 (85.7%)</td>
<td>1.0 (0.7–1.3)</td>
<td>1.0 (0.7–1.3)</td>
<td></td>
</tr>
<tr>
<td>≥$176</td>
<td>10/13 (76.9%)</td>
<td>1.0 (0.5–2.0)</td>
<td>1.0 (0.5–2.0)</td>
<td></td>
</tr>
<tr>
<td>Smoking Status</td>
<td>Never smoker</td>
<td>12/14 (85.7%)</td>
<td>1.0 (0.6–1.6)</td>
<td>1.0 (0.6–1.6)</td>
</tr>
<tr>
<td>Past smoker</td>
<td>15/15 (100%)</td>
<td>1.0 (0.6–1.6)</td>
<td>1.0 (0.6–1.6)</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>17/22 (77.3%)</td>
<td>1.0 (0.6–1.6)</td>
<td>1.0 (0.6–1.6)</td>
<td></td>
</tr>
<tr>
<td>HIV Status</td>
<td>Negative</td>
<td>2/3 (66.7%)</td>
<td>0.51 (0.1–1.5)</td>
<td>0.51 (0.1–1.5)</td>
</tr>
<tr>
<td>Positive</td>
<td>2/3 (66.7%)</td>
<td>1.6 (0.3–10.0)</td>
<td>1.6 (0.3–10.0)</td>
<td></td>
</tr>
</tbody>
</table>

CONCLUSION

• The prevalence of diabetes was higher among patients with MDR TB compared to patients with any resistance or fully susceptible
• Diabetes was associated with primary infection of MDR TB
• Diabetes reduced the rate of sputum culture conversion during MDR TB treatment
• Understanding risk factors for primary infection of MDR TB, including the role of diabetes, will help improve effective MDR TB prevention efforts.
• Understanding the role of diabetes in MDR TB treatment will help clinicians to determine which patients may need longer time to convert sputum cultures
• Further studies are needed to determine if household contact members with diabetes are at increased risk of developing active TB from MDR TB index patients.