Contacts of Retreatment Tuberculosis Cases with a Prior Poor Treatment Outcome are at Increased Risk of Latent Tuberculosis Infection

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Short Communication

Contacts of retreatment tuberculosis cases with a prior poor treatment outcome are at increased risk of latent tuberculosis infection

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1. Introduction

Tuberculosis (TB) remains a serious global public health problem, including in the country of Georgia. In 2014, the World Health Organization (WHO) reported the incidence rate of TB in Georgia to be 106 cases per 100 000 persons.1 Georgia has high rates of multidrug-resistant (MDR) TB. Close contacts of persons with active TB disease are at increased risk of latent TB infection (LTBI) and active TB disease.2 Contact investigation of close contacts is a recommended control strategy for active TB case finding and for detecting individuals with LTBI who are at increased risk of progressing to active TB disease.3–5

Contact investigations are commonly conducted in high-income, low TB incidence countries, but are generally not part of routine TB control efforts in most low- and middle-income countries (LMIC). Nonetheless, contact investigations are recommended by the WHO in LMIC where the burden of TB disease is greatest.3 In 2012, the National Center for Disease Control and Public Health (NCDC) initiated a nationwide TB contact investigation program in the country of Georgia. Using data from this program, it was aimed to estimate the prevalence of and risk factors for LTBI among contacts of index patients with a prior history of treatment for active TB (retreatment cases).

2. Methods

This cross-sectional study was conducted using surveillance data from the entire country of Georgia. Only the close contacts of
Table 1
Association of index case previous TB treatment outcome and the prevalence of LTBI among their contacts

<table>
<thead>
<tr>
<th>Outcome of index case, previous TB treatment</th>
<th>Contacts with LTBI (%)</th>
<th>Contacts without LTBI (%)</th>
<th>OR (95% CI)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cured</td>
<td>8 (15.1)</td>
<td>45 (84.9)</td>
<td>1.00</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Completed</td>
<td>16 (37.2)</td>
<td>27 (62.8)</td>
<td>3.33 (1.26–8.82)</td>
<td>0.01</td>
</tr>
<tr>
<td>Lost to follow-up</td>
<td>14 (50.0)</td>
<td>14 (50.0)</td>
<td>5.63 (1.96–16.16)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Failure</td>
<td>8 (53.3)</td>
<td>7 (46.7)</td>
<td>6.43 (1.81–22.72)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

TB, tuberculosis; LTBI, latent tuberculosis infection; OR, odds ratio; CI, confidence interval.

Table 2
Prevalence of LTBI among contacts of index TB retreatment cases based on the index patient’s prior TB treatment outcome

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>aOR (n = 131)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome completed vs. cured</td>
<td>3.25</td>
</tr>
<tr>
<td>Outcome lost to follow-up vs. cured</td>
<td>3.67</td>
</tr>
<tr>
<td>Outcome failure vs. cured</td>
<td>7.75</td>
</tr>
<tr>
<td>Household vs. non-household contact</td>
<td>3.03</td>
</tr>
<tr>
<td>Male contacts vs. female contacts</td>
<td>1.57</td>
</tr>
</tbody>
</table>

LTBI, latent tuberculosis infection; TB, tuberculosis; aOR, adjusted odds ratio (the model included all variables in the table); CI, confidence interval.

4. Discussion

This investigation appears to be the first to report that contacts of index patients with active TB disease who are retreatment TB cases (index cases) were sputum AFB smear-positive at the time of diagnosis as a retreatment case, identified between April and December 2012, were included. Epidemiologists affiliated with the NCDC interviewed each index retreatment case to determine close contacts, defined as members of the same household and non-household contacts who had daily contact with the index patient. Contacts were offered tuberculin skin testing; if they accepted, a tuberculin skin test (TST) was carried out using the Mantoux method, with 0.1 ml tuberculin. An induration of >10 mm was defined as a positive TST. LTBI was defined as having a positive TST (the first step of investigation) without symptoms of active TB disease. Contacts with a positive TST were referred to a TB physician for further evaluation, but were not followed up as part of this study.

Analyses were performed using SAS version 9.3 software (SAS Institute Inc., Cary, NC, USA). Bivariate analyses and multivariable logistic regression analyses were used to calculate odds ratios (OR) and 95% confidence intervals (95% CI) for the risk of LTBI among contacts. The primary exposure of interest was the index patient’s outcome of previous TB episode: cure, completion, loss to follow-up, or failure. Treatment outcomes were defined based on WHO definitions. Model building and selection was based on the purposeful selection of covariates strategy. A two-sided p-value of <0.05 was considered statistically significant for all analyses. The study was approved by the institutional review boards of Emory University and the Georgian NCDC.

3. Results

Among 583 close contacts of index patients with active TB and a prior history of TB (i.e., retreatment cases), 139 (24%) received a TST and were included in this analysis. The overall prevalence of LTBI among these contacts was 33% (46/139). The prevalence of LTBI was significantly higher among those contacts whose index TB case had had an unfavorable treatment outcome (failed or lost to follow-up) during their prior treatment episode compared to those whose index patient had had a favorable outcome (cured or completed) (OR 3.14, 95% CI 1.48–6.70). Further analysis showed that contacts whose index TB case had failed, was lost to follow-up, or completed treatment had a significantly higher prevalence of LTBI compared to contacts of TB cases who had previously been cured (Table 1).

On multivariable analysis, controlling for sex of the contact and type of contact, independent risk factors for LTBI included being a contact of an index TB case who had completed treatment (adjusted OR (aOR) 3.25, 95% CI 1.20–8.78), was lost to follow-up (aOR 3.67, 95% CI 1.13–11.89), or had failed treatment (aOR 7.75, 95% CI 2.05–29.32), as compared to contacts of TB cases who had had a prior outcome of cure (Table 2).

References