Evaluation of symptom screening methods for tuberculosis: a secondary analysis of a nationwide tuberculosis prevalence survey in Mongolia

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Symptom screening for tuberculosis (TB) is a key component for identifying TB suspects and TB cases, particularly in resource-limited countries. This study aimed to evaluate the effectiveness of symptom screening using TB-related symptoms including the standard symptom screening criterion of cough for two weeks or more, to identify TB cases in the general population. This study is a secondary analysis of the nationwide population-based, cross-sectional survey for TB prevalence in Mongolia in 2014-2015. Each TB-related symptom was compared between bacteriologically confirmed TB cases and bacteriologically negative participants. Of the 50,309 adults who received symptom screening, 248 were diagnosed as bacteriologically confirmed TB cases. The sensitivity and specificity of standard symptom screening of cough for two weeks or more were 20.6% and 95.3%, respectively. The higher sensitivity and lower specificity were reported in sputum for two weeks or more (22.2% and 93.6%, respectively), in fever for four days or more (21.4% and 95.0%, respectively), in weight loss (36.3% and 89.3%, respectively), in combination with standard symptom screening. TB cases had more “chronic cough: cough for two weeks or more” (OR 2.78, 95% CI: 1.83-4.22), “chronic sputum: sputum for two weeks or more” (OR 1.67, 95% CI: 1.06-2.65), “fever for four days or more” (OR 3.46, 95% CI: 1.90-6.28) and “weight loss” (OR 3.73, 95% CI: 1.90-6.28).
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2.77-5.02). The addition of TB-related symptoms, namely, chronic sputum, fever and weight loss to chronic cough, which is the standard symptom screening criterion, may facilitate the detection of more TB cases efficiently.
Introduction

Tuberculosis (TB) remains one of the major health problems in many countries and is one of the 10 leading causes of death worldwide. A total of 10 million people was affected by TB and 1.5 million (including 251,000 people living with HIV) died from TB in 2018 (Organization, 2019; WHO factsheet. Tuberculosis., 2019). Under the goal of “End TB Strategy by 2030”, the results of global efforts have been seen; however, many countries have stagnated and still face challenges (“WHO News release: New global commitment to end tuberculosis. 17 November, 2017”).

TB also remains one of the pressing public health challenges in Mongolia, which is one of the seven countries with a high TB burden among 37 countries of the Western Pacific Region. TB is the sixth leading cause of all-cause population mortality and the first leading cause of mortality due to communicable diseases (Ministry of Health of Mongolia, 2008). More than half (59%) of the reported TB cases had pulmonary TB and the detection rate was 75.5%. Out of the total TB cases, 56% were men and 69% were young people aged 15-24 years. There is a concern that young people at their most productive age increasingly suffer from TB and multidrug-resistant tuberculosis morbidity and mortality in the last few years.

It is important to detect TB patients and start treatment early to prevent the
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Spread of TB in the community. Systematic screening for active TB is defined as “systematic identification of people with suspected active TB, in a predetermined target group, using tests, examinations or other procedures that can be applied rapidly” (Organization, 2013). TB screening, mostly conducted by screening of symptoms such as cough for two weeks or more and/or chest radiography (CXR) screening, potentially contributes to identifying cases earlier before the disease progresses (Kranzer et al., 2013).

The reported sensitivity and specificity of these screening methods varied depending on the survey situation. Nationwide TB prevalence surveys have been conducted mainly in countries with a high TB burden to estimate TB prevalence and to clarify the actual state of TB in these countries using a random sampling method (Floyd et al., 2013; Kebede et al., 2014; Law et al., 2015; Mao et al., 2014; Onozaki et al., 2015). These surveys indicate the high sensitivity and moderate specificity of CXR screening and the low sensitivity of symptom screening to detect active TB cases in the general population. The first nationwide TB prevalence survey in Mongolia was conducted between 2014 and 2015, identifying a total of 248 active TB cases. In this survey, CXR screening found 94.4% of TB cases, whereas symptom screening using the criterion of cough for two weeks or more found only 20.6% of TB cases (Ministry of
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Health of Mongolia, 2016).

However, the wide introduction of CXR screening is difficult, particularly in low- and middle-income and resource-limited countries with TB burden such as Mongolia owing to the high cost of CXR apparatus and the need for certain skills for readers. On the other hand, symptom screening is simple, quick and does not require any equipment. Therefore, it is necessary to utilize symptom screening more effectively.

This study aimed to evaluate the effectiveness of symptom screening using TB related-symptoms including the standard symptom criterion of cough for two weeks or more, to identify TB cases in the general population.

**Methods**

**Survey design and sample size**

The nationwide population-based, cross-sectional survey for TB prevalence was designed in accordance with the WHO recommendations (Organization, 2011). The sample size was calculated to estimate the nationwide TB prevalence. A stratified cluster sampling using probability proportional to size was used to select 51 clusters in urban stratum and 47 clusters in rural and remote strata. A cluster was defined as a settlement with a population of at least 600 resident adults in urban stratum and 500
resident adults in rural and remote strata. A resident adult was defined as a person over the age of 15 years living in the selected household for at least two weeks. Adults in institutional and closed settings such as military barracks, hospitals, nursing homes, prisons, dormitories, mining camps and other occupational quarters located in the cluster were excluded. The total required sample size for a two-stage national survey was estimated to be 50,600 adults over the age of 15 years for an assumed prevalence of 180 per 100,000 smear-positive TB, with a relative precision of 25% at 95% confidence level, a design effect of 1.22, and a participation rate of 85%.

**Survey procedures**

The survey data was collected from April to November in 51 urban clusters in 2014 and in 47 rural and remote clusters in 2015. Figure 1 shows the selected provincial centers and rural soums (i.e., country subdivision of Mongolia). In each cluster, a house-to-house census was conducted to enumerate all subjects living in a household, including resident adults, children and temporary visitors. Of the enumerated subjects, resident adults were asked to provide written informed consent to participate in the survey. Those who consented were registered as study participants.

At the field operation site, participants were screened for the symptom
suggestive of TB (defined as cough for two weeks or longer) using one-on-one interviews. Participants were also asked about the presence of other TB-related symptoms such as cough with its duration, sputum with its duration, blood sputum/hemoptysis with its duration, fever with its duration, chest pain, shortness of breath, appetite loss, night sweating, and loss of body weight. These symptoms could be classified into lung-related symptoms (cough, sputum, blood sputum/hemoptysis, chest pain, shortness of breath) and systematic symptoms (fever, appetite loss, night sweating, loss of body weight). The presence of these symptoms was self-judged by participants. Participants also underwent antero-posterior chest X-ray (CXR) examination for any radiological abnormality suggestive of TB (which was judged as an abnormal shadow in the lung and mediastinum field and/or the presence of pleural fluid) with a mobile or portable digital X-ray unit. Participants with cough for two weeks or longer and/or CXR abnormality suggestive of TB were classified as eligible for laboratory diagnostics, and were requested to provide two sputum specimens (one on the spot, and another in the following morning).

**Diagnostic procedures**

Sputum specimens collected in the field were transported using cold chain to
the National TB Reference Laboratory of the Mongolian National Center for Communicable Diseases (NCCD) and examined by smear and culture. A central medical panel determined the final diagnosis based on the findings of bacteriological and CXR examinations using standard case definitions by the WHO task force group. The final cases determined as bacteriologically confirmed TB cases consisted of smear-positive TB cases and smear-negative culture-positive TB cases.

Data analysis

All census cards, informed consent forms, screening questionnaires and laboratory reports were checked and entered into MS Access-based database by trained data entry operators at NCCD. Data were double-entered and discrepancies were resolved by checking against the raw data. Data analysis was performed using STATA 14/SE software package (Stata Corp. LP, College Station, USA). The chi-square test was used for each symptom to compare bacteriologically confirmed TB cases with bacteriologically negative participants in this study. Operating characteristics, including sensitivity, specificity, positive predictive value and negative predictive value were calculated for a single TB symptom and combination with more than two weeks cough. Receiver operating characteristic (ROC) analysis was used to determine the optimal
cut-off values for symptoms with their durations. A p-value of < .05 was considered statistically significant. Multivariate analysis was also performed for symptoms with a significant level of association with bacteriologically confirmed TB, and adjusted odds ratios and 95% confidence intervals (CIs) were calculated.

**Ethical considerations**

The study protocol was approved by the Scientific Committee of NCCD and the Medical Ethical Review Committee of the Ministry of Health of Mongolia (04-2013). The protocol was also reviewed by the WHO Regional Office for Western Pacific Region and the WHO Global Task Force on TB Impact Measurement.

Eligible individuals were informed about the study procedures, risks, benefits and voluntary nature of participation in the study, and were asked to sign an informed consent form. For minors, the informed consent was obtained from their parents or guardians.

Immobilized persons and those who refused were excluded from CXR examination. Radiation safety procedures were applied to ensure the protection of participants, X-ray technicians and radiologists. Detected TB cases and bacteriologically negative participants with positive CXR results were referred to local
Results

Study profile

A total of 85,860 individuals in 98 clusters were enumerated and 60,031 (69.9%) of them were eligible for the survey. Excluded subjects consisted of 19,400 (32.3%) children under the age of 15 years, and 6,429 (10.7%) individuals did not meet the residential duration criteria. Of the 60,031 eligible subjects, 50,309 (83.8%) individuals participated in the survey. Of these survey participants, 50,194 (99.8%) subjects underwent symptom screening interview, 49,521 (98.4%) subjects had CXR examination, and 749 subjects did not have CXR examination because of old age, disability, refusal or other reasons.

Through the field screening by symptom screening and CXR examination, 10,359 (20.6%) subjects were judged as being eligible for sputum examinations, out of which 9,546 (92.1%) subjects submitted at least one sputum specimen. Both two smear microscopy and culture results were available for 9,473 (91.5%) of the requested individuals.

A total of 248 bacteriologically confirmed TB cases were detected in this
survey after the review by the central team. They included 88 participants as smear-positive TB cases and 160 participants as smear-negative culture-positive TB cases.

**TB symptoms among participants and survey of TB cases**

Findings of the symptom screening are summarized in Table 1. A total of 50,194 participants took part in the TB-related symptom screening. Based on the symptom screening criterion of cough for more than two weeks in this study, 4.7% (2,383) of the participants were found to be eligible for sputum collection. The presence of cough regardless of the duration was reported by 7,091 (14.1%) participants, with 40,103 (85.9%) reporting no cough at the time of the study. The presence of sputum of any duration was reported by 6,482 (12.9%) survey participants, with 3.8% (1,924) of the participants reporting a sputum duration of two weeks or more. The presence of fever of any duration was reported by 1,294 (2.6%) survey participants.

The optimal cut-off values of TB-related symptoms with their durations were determined using ROC analysis and their clinical relevance (Figure 2). The sensitivity and specificity of cough for two weeks or more for bacteriologically confirmed TB in the population with cough were 62.2% and 63.1%, respectively. The sensitivity and
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Specificity of sputum for two weeks or more in the population with sputum were nearly identical at 60.3% and 63.2%, respectively. The sensitivity of fever for four days or more was 73.7% and its specificity was 70.1% in the population with fever.

Table 2 shows the numbers of bacteriologically confirmed TB cases and participants having TB-related symptoms in combination with cough for two weeks or more, which was the national standard symptom screening criterion to suspect TB cases in Mongolia. The sensitivity increased in combination with other TB-related symptoms compared with the standard symptom screening, but the specificity decreased.

Table 3 shows the sensitivity, specificity, positive predictive value and negative predictive value of a single TB-related symptom and the combination of TB-related symptoms with the standard symptom screening of cough for two weeks or more, based on the calculated prevalence of bacteriologically confirmed TB of 559.6 per 100,000 population (Ministry of Health of Mongolia, 2016). “Weight loss and/or cough for two weeks or more” had a sensitivity of 36.3% and a specificity of 89.3%, with a positive predictive value of 1.9%. “Fever for four days or more” had a higher positive predictive value. The negative predictive value was in the range of 99.5%-99.6%.

The multivariate logistic regression model indicated the following results: “cough for two weeks or more” (OR 2.78, 95% CI: 1.83-4.22), “sputum for two weeks
or more” (OR 1.67, 95% CI: 1.06-2.65), “fever for four days or more” (OR 3.46, 95% CI: 1.90-6.28) and “weight loss” (OR 3.73, 95% CI: 2.77-5.02) (Table 4).

Discussion

To the best of our knowledge, this study is the first nationwide study to identify the effectiveness of TB-related symptoms for screening TB in Mongolia. The prevalence of each TB-related symptom in bacteriologically confirmed TB cases ranged from 3.6% for blood sputum to 33.9% for cough of any duration. Among them, TB cases were significantly more symptomatic with “chronic cough for two weeks or more”, “chronic sputum for two weeks or more”, “fever for four days or more” and “the presence of weight loss” than non-TB cases. Regarding the combination of symptoms with cough for two weeks or more as the standard symptom screening criterion, “weight loss and/or cough for two weeks or more” had a sensitivity of 36.3% and a specificity of 89.3%, with a positive predictive value of 1.9%.

Chronic cough for two weeks or more had a sensitivity of 20.6%, which is lower than previous reports (Assefa, Woldeyohannes, Gelaw, Hamada, & Getahun, 2019; Chadha et al., 2019; Lalli et al., 2018). The sensitivity and specificity of chronic cough vary in range depending on the target population and survey situation, and there
are several possibilities of low sensitivity of chronic cough for two weeks or more in this study.

The prevalence of TB symptoms depends on the profile of the target population. TB cases identified from patients in clinics and hospitals and at-risk groups were reported to be symptomatic (Ayles et al., 2009; Miller et al., 2000; Onozaki et al., 2015; Wood et al., 2007). In the present study, a sampling method was determined to estimate the nationwide TB prevalence using a random sampling method. Nationwide TB prevalence surveys targeted general population indicate the low sensitivity of symptom screening to detect active TB cases in the general population, ranging from 21% in Myanmar to 60% in Pakistan (Kebede et al., 2014; Law et al., 2015; Mao et al., 2014; Onozaki et al., 2015; Qadeer et al., 2016). Therefore, it was intended for the general population, and this might have affected the low sensitivity of chronic cough.

HIV infection also increases a risk of developing TB (Ahmad Khan et al., 2014). The prevalence of TB symptoms was reported to be high in HIV-positive patients, with a sensitivity of 47.9% for screening with chronic cough and 81.3% for screening with five TB-related symptoms (Corbett et al., 2010). Similarly, van’t Hoog et al. (2014) reported a higher sensitivity in counties with a high HIV prevalence than in countries with a low HIV prevalence. Although the HIV statuses of the non-TB
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participants and TB cases were not confirmed in this study, the estimated TB prevalence was reportedly less than 0.1% in 2018 and the reported number of HIV-positive patients with known HIV status was three in Mongolia in 2018 (Organization, 2018; UNAIDS, 2018). Therefore, most TB cases and non-TB participants were regarded as HIV-negative.

In the present study, TB cases were significantly more symptomatic with “chronic sputum for two weeks or more”, “fever for four days or more” and “the presence of weight loss” than non-TB cases. Sputum is one of the important symptoms in TB cases, and sputum examination by smear microscopy and culture is one of the gold standards for diagnosing TB (Alnour, 2018). Fever with low grade at onset and a worsening condition with disease progression and weight loss are also observed in TB patients (Ayles et al., 2009; Chadha et al., 2019; Long, Liang, Koyfman, & Gottlieb, 2019). Weight loss is one of well-recognized symptoms in the progression of TB, and nutrition status in active TB cases is tend to be poor compared with people without TB (van Lettow et al., 2003; Chiang et al., 2015; Grobler et al., 2016). Therefore, it is suggested that screening using a combination of these symptoms may help to identify more TB cases than screening using only the standard symptom criterion.

Although CXR screening has advantage in TB case detection, the wide
introduction of CXR screening is difficult, particularly in low- and middle-income and resource-limited countries with TB burden such as Mongolia owing to the high cost of CXR apparatus and the need for certain skills for readers (Ministry of Health of Mongolia, 2016). Under these circumstances, symptom screening using TB-related symptoms is an attractive choice and our results can be applied to improve TB case detection (van't Hoog et al., 2014). It is also important to evaluate the performance of screening methods and the further cost-effectiveness should be examined (van't Hoog et al., 2013; Law et al., 2015).

Some limitations of this study are as follows. Firstly, the main limitation of the present survey was that the prevalence of pediatric and extrapulmonary TB was not estimated. The survey was designed to evaluate bacteriologically confirmed TB cases among an adult population and did not intend to assess the situation with childhood and extrapulmonary TB. Secondly, symptom screening in the present survey used only the standard criterion of cough for two weeks or more, and other symptoms were not included in the survey screening for sputum submission. Therefore, this may lead to the underdetection of TB cases. Thirdly, this study was designed to estimate the nationwide TB prevalence in a general population. Thus, there is a possibility that the subgroups with a high risk for TB are not reflected.
Conclusion

Symptom screening in TB represented by chronic cough for two weeks or more as a key component is the standard method for identifying active TB cases. This study found that bacteriologically confirmed TB cases were more symptomatic with “chronic cough for two weeks or more”, “chronic sputum for two weeks or more”, “fever for four days or more” and “the presence of weight loss” than non-TB cases. The study also found that the addition of these symptoms to the standard symptom criterion of chronic cough for two weeks or more increased the sensitivity. The findings suggest that symptom screening using a combination of symptoms may detect more TB cases. It is proposed that these findings be reflected in the national TB strategy and in the active detection of TB cases in focused groups to facilitate the effective use of symptom screening.
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Figures and Tables

Figure 1. Selected provincial centers and rural soums (i.e., country subdivision of Mongolia)
**Table 1**

*TB symptoms of bacteriologically confirmed TB cases and bacteriologically negative participants*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Bacteriologically confirmed TB cases</th>
<th>Participants (bacteriologically negative)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>Cough (yes/no)</td>
<td>84</td>
<td>33.9%</td>
</tr>
<tr>
<td>Cough (&gt; 2 wks)</td>
<td>51</td>
<td>20.6%</td>
</tr>
<tr>
<td>Sputum (yes/no)</td>
<td>72</td>
<td>29.0%</td>
</tr>
<tr>
<td>Sputum (&gt; 2 wks)</td>
<td>38</td>
<td>15.8%</td>
</tr>
<tr>
<td>Fever</td>
<td>21</td>
<td>8.5%</td>
</tr>
<tr>
<td>Blood sputum</td>
<td>9</td>
<td>3.6%</td>
</tr>
<tr>
<td>Chest pain</td>
<td>59</td>
<td>23.8%</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>63</td>
<td>25.4%</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Percentage</th>
<th>Total Cases</th>
<th>Reference Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appetite loss</td>
<td>31</td>
<td>12.5%</td>
<td>2,796</td>
<td>94.4%</td>
</tr>
<tr>
<td>Weight loss</td>
<td>67</td>
<td>27.0%</td>
<td>3,453</td>
<td>93.1%</td>
</tr>
<tr>
<td>Night sweats</td>
<td>52</td>
<td>21.0%</td>
<td>4,584</td>
<td>90.8%</td>
</tr>
</tbody>
</table>

*Note.* Bacteriologically confirmed TB cases included smear-positive TB cases and smear-negative culture-positive TB cases.
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Figure 2

Receiver Operating Characteristic (ROC) curves of TB-related symptoms with duration

(2A: cough, 2B: sputum, 2C: fever) AUC: area under the curve

cough AUC=0.634
sputum AUC=0.638
fever AUC=0.806
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Table 2

*Combination of TB-related symptoms with standard symptom screening of cough for two weeks or more*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Bacteriologically confirmed TB cases</th>
<th>Participants (bacteriologically negative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number</td>
<td>248</td>
<td>49,946</td>
</tr>
<tr>
<td>Cough (≥ 2 wks)</td>
<td>51</td>
<td>2,332</td>
</tr>
<tr>
<td>and/or</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cough (any duration)</td>
<td>84</td>
<td>7,007</td>
</tr>
<tr>
<td>Sputum (any duration)</td>
<td>79</td>
<td>7,195</td>
</tr>
<tr>
<td>Sputum (≥ 2 wks)</td>
<td>55</td>
<td>3,193</td>
</tr>
<tr>
<td>Fever</td>
<td>58</td>
<td>3,335</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Symptom</th>
<th>No.</th>
<th>Percentage</th>
<th>Count</th>
<th>Positive Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood sputum</td>
<td>52</td>
<td>21.0%</td>
<td>2,891</td>
<td>94.2%</td>
</tr>
<tr>
<td>Chest pain</td>
<td>81</td>
<td>32.7%</td>
<td>7,719</td>
<td>84.5%</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>84</td>
<td>33.9%</td>
<td>10,332</td>
<td>79.3%</td>
</tr>
<tr>
<td>Appetite loss</td>
<td>69</td>
<td>27.8%</td>
<td>4,784</td>
<td>90.4%</td>
</tr>
<tr>
<td>Weight loss</td>
<td>90</td>
<td>36.3%</td>
<td>5,351</td>
<td>89.3%</td>
</tr>
<tr>
<td>Night sweats</td>
<td>78</td>
<td>31.5%</td>
<td>6,327</td>
<td>87.3%</td>
</tr>
</tbody>
</table>

Note. Bacteriologically confirmed TB cases included smear-positive TB cases and smear-negative culture-positive TB cases.
Table 3

Comparison of sensitivity, specificity, positive predictive value and negative predictive value

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Cough for 2 weeks or more</th>
<th>Cough for 2 weeks or more and/or Sputum for 2 weeks or more</th>
<th>Cough for 2 weeks or more and/or Fever for 4 days or more</th>
<th>Cough for 2 weeks or more and/or Weight loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>20.6%</td>
<td>22.2%</td>
<td>21.4%</td>
<td>36.3%</td>
</tr>
<tr>
<td>Specificity</td>
<td>95.3%</td>
<td>93.6%</td>
<td>95.0%</td>
<td>89.3%</td>
</tr>
<tr>
<td>Positive Predictive Value</td>
<td>2.4%</td>
<td>1.9%</td>
<td>2.4%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Negative Predictive Value</td>
<td>99.5%</td>
<td>99.5%</td>
<td>99.5%</td>
<td>99.6%</td>
</tr>
<tr>
<td>Symptom</td>
<td>Sputum for 2 weeks or more</td>
<td>Fever for 4 days or more</td>
<td>Weight loss</td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td>-------------------------</td>
<td>------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td><strong>Sensitivity</strong></td>
<td></td>
<td>15.3%</td>
<td>5.6%</td>
<td>27.0%</td>
</tr>
<tr>
<td><strong>Specificity</strong></td>
<td></td>
<td>96.2%</td>
<td>99.4%</td>
<td>93.1%</td>
</tr>
<tr>
<td><strong>Positive Predictive Value</strong></td>
<td></td>
<td>2.2%</td>
<td>5.0%</td>
<td>2.2%</td>
</tr>
<tr>
<td><strong>Negative Predictive Value</strong></td>
<td></td>
<td>99.5%</td>
<td>99.5%</td>
<td>99.6%</td>
</tr>
</tbody>
</table>
Table 4

Multivariate analysis of TB-related symptoms with bacteriologically confirmed TB cases

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Adjusted Odds Ratio</th>
<th>95%CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough for 2 weeks or more</td>
<td>2.78</td>
<td>1.83 – 4.22</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Sputum for 2 weeks or more</td>
<td>1.67</td>
<td>1.06 – 2.65</td>
<td>.03</td>
</tr>
<tr>
<td>Fever for 4 days or more</td>
<td>3.46</td>
<td>1.90 – 6.28</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Weight loss</td>
<td>3.73</td>
<td>2.77 – 5.02</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

*Note.* Bacteriologically confirmed TB cases included smear-positive TB cases and smear-negative culture-positive TB cases.