

# Cross-sectional screening of healthcare workers at a regional chest clinic with an interferon gamma release assay: first report from Sri Lanka

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**Abstract.** *Introduction:* Sri Lanka is a moderate burden middle-income setting where healthcare workers (HCWs) are not routinely screened for TB infection, even in moderate to high transmission risk settings. This study evaluated the use of a commercial interferon gamma release assay (IGRA) in HCW screening in comparison to the tuberculin skin test (TST) in a regional chest clinic.

*Methods:* HCWs ( $n=39$ ) serving at the study clinic, where over 500 TB patients are registered and treated every year, were screened for LTBI with both the TST and an IGRA. Factors associated with positive test results as well as agreement between the two tests were evaluated.

*Results:* 47.2% of HCWs screened were TST positive (10 mm cut-off) and positivity was associated with working in poorly ventilated areas ( $P=0.019$ , OR 5.133 (95% CI 1.23 – 21.35)), although not associated with working in the sputum laboratory or TB treatment room, age or gender. IGRA positivity was significantly lower, 15.7% ( $P=0.003$ ). Positivity was associated with male gender ( $P=0.046$ ) and a shorter duration of service at the chest clinic ( $P=0.036$ ), though it was not associated with work in risk areas. Agreement between tests (TST 10 mm cut-off) was fair with a kappa of 0.30 ( $P=0.013$ ). Positive IGRA results were seen only in TST-positive subjects who had a TST reading of >15 mm.

*Conclusions:* Occupational and non-occupational factors associated with TST and IGRA positivity differed between tests. Short duration of service was associated with IGRA positivity. The IGRA showed no advantage over the TST as a test for LTBI in this setting.

**Additional keywords:** LTBI screening, tuberculin skin test.

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## Introduction

The risk of nosocomial transmission of tuberculosis (TB), particularly in healthcare settings where large numbers of smear-positive TB patients are treated and poor infection control measures are in place, is well recognised. This is particularly true for high and moderate TB burden settings in low and middle income countries, where the focus on WHO-recommended infection control measures is minimal despite having over 90% of the global TB burden.<sup>1–3</sup> Healthcare workers (HCWs) screening for latent tuberculosis infection

(LTBI) using the tuberculin skin test (TST) carried out in high and moderate TB burden countries such as Thailand, India and South Africa have shown positivity rates of 33–79% with a pooled prevalence of 54%.<sup>1</sup> Significant risk factors for TST positivity included non-occupational factors such as age, male gender and BCG scar, and occupational factors including years of service (>1 year), work location (high v. low TB incidence) and particular occupations (nurses, laboratory technicians, radiographers, patient attendants and maintenance personnel).<sup>1,4,5</sup> In screening of HCWs, serial

### Implications

- High rates of tuberculin skin test positivity in healthcare workers at a local chest clinic requires investigation into infection risks and control measures.
- Interferon gamma release assays show no advantage over the tuberculin skin test in this moderate burden, moderate transmission risk setting.

testing becomes necessary as many trained personnel often serve for several years in the same institute. As the TST is an *in vivo* test, boosting of the immune response is seen with repeated testing<sup>6</sup> making its utility in serial testing limited.

Studies done using interferon gamma release assays (IGRAs) have shown that test positivity was associated with duration of service while being unaffected by BCG vaccination and previous TST testing. They were also shown to be a cost-effective method for HCW screening and have therefore been recommended for use in LTBI screening.<sup>7–10</sup> However, meta-analysis of results have shown conflicting findings with concordance between these two tests and association with risk factors varying greatly between studies.<sup>11</sup> Studies in low burden countries showed poor agreement between IGRAs and TST, with TST-positive and IGRA-negative result combinations being predominantly seen while the few studies done in high incidence countries showed good agreement between both tests.<sup>10,11</sup>

In Sri Lanka, a moderate TB burden middle income country, all medical professionals are screened for lung disease with a chest X-ray at the beginning of their service in the health sector, but no further follow-up screening is done during service. As national policy since 1963, all citizens are given the BCG vaccination as a single dose at birth. All healthcare facilities follow basic infection control principles but specific measures required for TB control are not followed in most institutes. Most patients with suspected PTB are referred to a regional chest clinic for investigation and all PTB patients are registered at a regional chest clinic for treatment and follow-up. Therefore, while all HCWs are at potential risk of PTB infection from patients, both identified and unidentified, HCWs at chest clinics and chest hospitals are at particularly high risk. Screening of HCWs in these institutes for latent TB infection is not a routine practice.

The Chest Clinic Bogambara is one of the largest chest clinics in the country with over 10 000 new patients being registered and treated for lung diseases each year. Over 500 PTB patients are registered for treatment annually. This patient load is managed by a total of 55 HCWs including medical and nursing officers, laboratory and radiography staff, administrative staff, pharmacists, public health officers and attendants.

The building of the chest clinic was constructed in 1955 and although ventilation fans were installed for closed spaces

at that time, they are no longer functional. A new separate section for registration and follow-up of TB patients was built and put into use in 2013. In this moderate TB transmission risk setting,<sup>12</sup> screening of staff is not routinely done and managerial, administrative and environmental controls in place are minimal. This study was performed to assess the use of a commercial IGRA for screening in HCWs for LTBI in this setting in comparison with the TST.

### Methods

The study was conducted from August to October 2013. Ethical clearance for the study was obtained from the Ethical Review Committee of the Teaching Hospital Kandy. All HCWs serving at the chest clinic Bogambara during the study period were eligible to participate. Details of clinical history including any current symptoms, co-morbidities, duration of service and current area of work at the chest clinic were recorded from all consenting participants. Results of any recent investigations done, including chest X-ray, erythrocyte sedimentation rate (ESR) and TST result (mantoux method) from testing done 6 months to 1 year previously (done as part of another study conducted at the chest clinic) were documented. The commercial IGRA T-SPOT.TB from Oxford Immunotec, Abingdon, UK, was performed on blood samples obtained from each HCW at the Department of Microbiology, Faculty of Medicine, University of Peradeniya. The assay was carried out using equipment and reagents according to manufacturers' recommendations. Spot counting was done manually using a USB microscope.

Three high risk areas were defined. These included the poorly ventilated sputum laboratory where direct smears are made on the open bench and microscopy is done, the nebulisation and DOTS (directly observed therapy) room where all smear-positive patients come to receive DOTs, and nebulisation for sputum induction is done, and the TB treatment room where all TB patients are sent for initial registration and for all follow-up visits. In addition, two poorly ventilated areas where patients congregate were noted. These were the central corridor of the building which had no external ventilation and was used as a patient waiting area, and the patient registration area that was used by patients awaiting new registration, follow-up patients, and those awaiting nebulisation and venepuncture. This area had no ventilation other than the doorway and a single window placed towards the rear of the space.

Association of TST and IGRA positivity with working in these areas was tested using the Chi-squared test for association. Differences in mean age and duration of service in different categories of HCWs were tested using the *t*-test, and association of gender and other factors with TST and IGRA result were tested using the Chi-squared test. When sample numbers were low (<5) in a given category, Fisher's exact test was used. As all HCWs had similar exposure hours (5–8 h per day) and the same category of exposure (share workplace with case), association between exposure hours

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