

Surveillance of Employees of Swiss Federal Asylum Centres for Latent Tuberculosis Infection

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Keywords

Tuberculosis · Healthcare workers · Asylum centres · Latent tuberculosis infection · LTBI

Abstract

Background: Asylum seekers in Switzerland have to register in federal asylum centres (FACs) before formal permission to enter the country. Some of them may have active tuberculosis (TB), exposing fellow refugees and employees. **Objectives:** The aim of this study was to assess the risk of TB infection among employees of Swiss FACs. **Methods:** Between 2010 and 2018, a free interferon-gamma release assay (IGRA) was offered to all employees of 8 FACs, at employment and at yearly intervals. We defined latent TB infection as IGRA conversion from negative to positive. IGRA-positive employees were referred to a medical centre for further clinical follow-up. **Results:** 1,427 tests were performed among 737 employees (54.6% male). 403 (55%) persons were tested only once; 330 (44.5%) were tested several times; for 4 (0.5%) persons, the number of IGRA tests is unknown. Twenty employees (2.7%) had a positive IGRA at baseline, 2 (0.6%) converted from negative to positive during follow-up, resulting in an

incidence of 22/10,000 person-years. We observed no case of active TB among employees. **Conclusions:** The prevalence of latent TB among employees to Swiss FACs and the risk of acquiring TB infection through work-related exposure are low. Yearly IGRA controls in the absence of documented TB exposure seem unnecessary. © 2021 S. Karger AG, Basel

Introduction

Tuberculosis (TB) patients with pulmonary involvement transmit the infection to bystanders through droplets spread into the air during coughing, sneezing, singing, or speaking. Healthcare workers may be exposed to patients with undetected or untreated pulmonary TB and are considered at increased risk of acquiring TB infection and, for some of them, progressing to active TB [1–3]. The risk of TB transmission is still high in countries with a high TB incidence, but in countries with low TB incidence, the infection risk is limited [4]. As all other European countries, Switzerland has a low TB incidence. Apart from healthcare workers and prison staff [5], workers in

Table 1. Number of IGRAs performed and test result in 737 employees across 8 FACs, 2010–2018*

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2017 | 2018 | Total |
|-----------------|------|------|------|------|------|------|------|------|-----------|
| Baseline tests | | | | | | | | | |
| Positive | 0 | 0 | 2 | 5 | 3 | 0 | 4 | 6 | 20 (2.4%) |
| Negative | 22 | 23 | 156 | 235 | 116 | 22 | 139 | 113 | 826 |
| Indeterminate | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 (0.3%) |
| Follow-up tests | | | | | | | | | |
| Stable positive | na | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 (3.4%) |
| Conversions | na | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 (3.4%) |
| Negative | na | 15 | 39 | 39 | 208 | 88 | 119 | 61 | 569 |
| Reversions | na | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 (3.4%) |
| Indeterminate | na | 0 | 0 | 2 | | 0 | 1 | 0 | 3 (3.8%) |
| Total | 22 | 38 | 197 | 283 | 330 | 110 | 263 | 184 | 1,427 |

IGRA, interferon-gamma release assays; FACs, federal asylum centres; na, not applicable. * No data were collected for 2016.

close professional contact with persons from high-incidence countries, defined arbitrarily as ≥ 100 per 100,000 population [6], may be exposed to TB.

Between 2010 and 2018, 15,000–39,000 migrants applied for asylum in Switzerland each year. The number of confirmed TB notifications to the Swiss Federal Office of Public Health in migrants diagnosed with active TB within 3 months after entry declined from more than 100 cases in the late 1990s to a mean of 42 cases per year between 2010 and 2018 (range: 21–66).

Swiss federal asylum centres (FACs) are thus considered institutions with potential TB risk. Swiss law requires employers to protect their employees [7, 8]. As all employees have close and frequent contact with the migrants, attention is given to the rapid detection of potentially transmissible diseases among the latter and to providing an adequate ventilation of the premises. Wearing of a face mask is not mandatory. A nursing staff is present on site, and rapid access to medical assistance is provided. The screening procedure for the detection of active TB among asylum seekers changed over time. Between 1992 and 2005, all (non-pregnant) asylum seekers aged 15 or older were systemically screened with a chest X-ray. In 2006, this procedure was replaced with a 34-language online tool (<http://www.tb-screen.ch/app/intro.php>), with questions covering TB symptoms, country of origin, and previous TB contacts, calculating a score to check if further clinical investigations were indicated. In 2018, the Swiss Epidemics Act was revised, rendering the online tool voluntary and providing basic education on TB symptoms and transmission as well as other relevant infectious diseases, in order to assure access to healthcare

and vaccination. In 2000, the *Swiss Lung Association* and the *Swiss National Accident Insurance Fund (SUVA)* recommended that employees who may be exposed to TB are screened for latent TB infection with a tuberculin skin test (TST) or an interferon-gamma release assay (IGRA) at hiring and that employees with a negative initial test working in a setting with elevated TB risk are re-tested at regular intervals [9]. In this article, we evaluate the risk of TB infection and the need for protective measures among men and women employed in Swiss FACs between 2010 and 2018.

Methods

Between January 2010 and December 2018, a blood test for the detection of latent TB infection (IGRA) was offered to employees of 8 FACs: Basel, Boudry, Vallorbe, Chiasso, Altstätten, Kreuzlingen, Zurich, and Zurich airport on a voluntary base. The test was repeated at yearly intervals in employees with a negative test result. Employees with a positive test result were referred to their family physician or to a pulmonary specialist for further medical follow-up. For logistical reasons, no tests were performed in 2016.

The participants gave a written consent for the registration of test results in an anonymous database aiming at the evaluation of the work-related risk of TB infection and improving protective measures if needed. Nationality, place of birth, place of prior employment, or comorbidities of the employees were not recorded/documented.

At the start of the observation period, all participating centres used T-SPOT.TB (Oxford Immunotec, Abingdon, UK). Blood samples were sent to the laboratory *Meditest* (later *Unilabs*) in Lausanne by express mail. Tests with a spot count of 0–4 were interpreted as negative, tests with a spot count of 5–7 were interpreted as borderline, and tests with a spot count of 8 or more were interpreted as positive. Borderline and indeterminate tests were repeat-

ed whenever possible on another blood sample and only the second test result was recorded. In 2018, the FACs in Kreuzlingen, Altstätten, and Zurich changed the procedure and performed a QuantiFERON Gold test (Qiagen, Hilden, Germany) instead of T-SPOT.TB. The sensitivity of both tests is between 80 and 90%, and specificity is between 95 and 97% [9, 10]. The laboratories transmitted anonymized test results to the *Swiss Lung Association* and to the *State Secretariat for Migration SEM*.

Results

Over the 8 active years of the study, 1,427 tests were performed among 737 employees (54.6% male). 403 (55%) persons were tested only once; 330 (44.5%) were tested twice or more times; for 4 persons (0.5%), the number of IGRA tests was unknown. The number of tests and the test results (positive, negative, and indeterminate) are reported in Table 1. Twenty employees (2.7%) had a positive IGRA at baseline (12 of them were male). Two employees (0.6%) converted from negative to positive during follow-up, resulting in an incidence of 22.0 per 10,000 person-years of follow-up (95% confidence interval: 5.5–87.9). One of these converters was a male member of the administrative staff, who started working in the FAC in 1999, had a negative test result in 2012, 2013, 2014, and 2017, and turned positive in 2018 (QuantiFERON 0.64 IU/mL). The other converter was a female member of the security staff, who started working in 2009, had a negative test result in 2011 and 2012, and turned positive in 2013 (T-SPOT.TB 10 sfu). Two employees who had a positive test result at baseline (one in 2012; the other in 2013) had a negative test result at a control performed 1 year later (reversion).

All employees with a positive test result were referred to a physician for clinical examination and a chest X-ray. None of them presented with symptoms or signs of active TB. The decision to offer a preventive treatment was left to the treating physician. Over the time of the study, no case of active TB among employees was observed.

Discussion

Screening for latent TB among employees of Swiss FACs between 2010 and 2018 showed that the risk of work-related TB infection is low. The baseline prevalence of positive test results (2.7%) and the incidence of new infections during follow-up (22/100,000 person-years of follow-up) were low, although all employees had close contacts with the asylum seekers in the FACs. These re-

sults are of the same order of magnitude as those reported for hospital employees in other low-TB-burden countries such as Canada [4] or the United States [11, 12] and much lower than the reports from high-TB-burden countries [1–3, 13]. Few studies have addressed the risk of work-related TB transmission outside hospitals: the risk of TB infection among prison inmates and staff is still considered substantial [5]. A study in Italy showed a prevalence of TST positivity of 9.9% among police officers dealing with migrants, with a progression by age from 1.6% in individuals aged 21–30 years to 14.1% in those aged over 50 years [14]. A hospital-based study in Germany also showed that the proportion of positive test results increased with age and duration of employment [15].

The risk of TB infection depends on the frequency of exposure to patients with untreated pulmonary TB, the duration of contact, and the concentration of infectious particles in the air. The latter mainly depends on the indoor environmental control. TB transmission is facilitated by overcrowding, poor ventilation, and congregate settings [16]. During an observation period prior to this study, 4 conversions were observed among 71 employees of one Swiss FAC. The facility had an inadequate ventilation system, with air flowing from the waiting area at the entrance, where newly arrived migrants stayed until registration, to the staff room further inside the building. After correction of the airflow direction towards outside, no further infection was observed in this centre over the next 8 years. Another ancient study in Switzerland demonstrated that the risk of infection was much higher among employees of an outpatient clinic where new migrants with health problems stayed in a closed waiting room during long periods before being examined than in the local hospital where the patients with known TB were hospitalized and treated [17].

The prevalence of latent TB in employees of Swiss FACs was even lower than seen in other low-TB-incidence countries with different immigration patterns (4.8% in the US and 8.7% in people without a history of TB exposure in the UK) [18, 19] and much lower than the estimated prevalence of latent TB infection worldwide [20]. The baseline prevalence in our study may not even reflect TB exposure in the FACs, as many employees originate from high-incidence countries – for example, refugees hired as translators or assistance staff – and may have been infected abroad, in previous working places in Switzerland or via non-professional social contacts, including family. Therefore, the 2 conversions observed during follow-up might better reflect the actual work-related risk.

The type of test we used for this study may influence the results. Since the introduction of IGRAs, these tests tend to replace the TST for surveillance purposes, at least in low-TB-incidence countries and in populations with a large proportion of prior *Bacillus Calmette-Guérin* vaccination. In a study of US healthcare workers with a very low proportion of prior *Bacillus Calmette-Guérin* vaccination, the proportion of positive tests was similar (5.2% for TST, 4.9 for QFT, and 6.0 for T-SPOT.TB). Contrastingly, the rate of post-baseline conversion was higher for IGRA than for TST; however, the majority of newly positive IGRAs reverted to negative at the next yearly control [12]. Another study in the USA confirmed the high rate (4.4%) of temporary conversions, 64.8% of them reverting to negative at control. The use of higher cut-offs for the definition of IGRA conversion yielded a conversion rate similar to historical conversion rates defined by TST increase in the same hospital settings [11, 21]. A more recent study among US hospital employees demonstrated that a very low proportion of them converted their TST over the observation period of 16 years (123/40,142), most of them without any documented exposure to TB and without confirmation by IGRA [22]. A German study resulted in similar low rates of conversion as defined by IGRA [23].

The question of the opportunity of systematic (for instance yearly) surveillance of exposed employees with a negative baseline test was much debated, mainly due to the observation of the high rate of temporary conversions and reversions and the seldom association with TB exposure [24]. In 2014, the Swiss recommendations for the surveillance of healthcare workers and employees in settings with an increased TB risk have changed [25]. Only one test at employment is recommended (allowing a detection of conversion in case of future exposure to TB). The forthcoming edition of the SUVA guidelines will do the same.

According to the CDC, positive IGRA results should be immediately confirmed by a repeated test, in order to minimize false positive results [26]. Recent data have demonstrated an association between the magnitude of the test result and the risk of future TB [27]. Therefore, the interpretation of the tests and the decision about the prescription of preventive treatment must take into account the individual risks (intensity of exposure, immune status, diabetes, current smoking, and age) and the intensity of the test result [28, 29]. In our study, the test results in both employees who converted were close to the cut-off and may have represented temporary and not true conversions. The use of a higher cut-off, as proposed by some experts, may have changed our results [30].

This study has several limitations. Firstly, as the tests were performed on a voluntary basis, we cannot exclude a selection bias, but we do not believe that this bias is in any way related to the risk of TB infection. Secondly, we did not record the duration of employment prior to the first testing. Most of the first tests were performed in new employees, but some employees were already working for several years or may have been active in similar settings (hospitals, prisons, shelters etc.) before. Some positive test results may thus reflect prior rather than current professional exposure. As the number of employees with a positive first test was low, we consider this a rare event. Similarly, because of overall small numbers, we did not study the correlation between age and IGRA positivity/conversion; however, this has already been demonstrated by several other studies.

Conclusions

The surveillance of employees of Swiss FACs, where occasional cases of active TB have been detected among asylum seekers at entry, has demonstrated that the risk of TB infection for employees is very low. According to the recent Swiss and US recommendations, we conclude that a single IGRA test performed at employment is sufficient and that systematic surveillance is unnecessary, except in cases of documented exposure to a case of transmissible pulmonary TB.

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Statement of Ethics

As the surveillance of the employees was performed in routine application of the federal regulations and according to the Guidelines of the SUVA, no Ethics Committee approval was requested.

Conflict of Interest Statement

The authors have no conflict of interest to declare.

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The costs of the laboratory analysis were taken in charge by the SEM or the professional organization to whom the employees belong. No other funding was needed.

Authors Contribution

J.P.Z., A.Z., and J.M.E. initiated the study, collected the results, and drafted the ms. A.Z. supervised the performance of the laboratory analysis and collected the results. A.K.D. supervised the organization in the FACs. A.J.S. performed the statistical analysis and reviewed the ms. All authors reviewed the final version of the ms.

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