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Medical students at risk of nosocomial tuberculosis

Madam,

The risk of tuberculosis (TB) transmission to healthcare workers (HCWs) is well known and was recently reviewed in low and high incidence countries.[1,2] TB infection control programmes in healthcare settings that include evaluation of latent TB infection (LTBI) in HCWs are recommended.[3] Few studies have evaluated the risk of TB infection among healthcare students.[1,2]

We conducted a study in Rio de Janeiro State, Brazil, to evaluate recently acquired LTBI among undergraduate medical students in three cities with TB incidence rates of 28, 63 and 114 per 100 000 inhabitants.

Students aged ≥18 years with a negative (<10 mm) baseline two-step tuberculin skin test (TST1/2) were considered eligible and underwent a third TST (TST3) at least six months later. TST2 was performed to evaluate the booster phenomenon.[4] Conversion was defined as an induration of ≥10 mm greater than the baseline. TST was done by a trained HCW using the Mantoux technique: PPD-RT 23, 2 TU, was applied to the volar aspect of the left forearm and the transverse diameter of the induration recorded 48–72 h later. Students were classified according to the average duration of exposure to patients weekly: <4 h (preclinical years); >4 h (early clinical years); and full time clinical rotations (late clinical years).

A self-administered questionnaire was completed to obtain information on age, sex, economic class, exposure to active TB cases and bacille Calmette–Guérin (BCG) vaccination. Eligible students signed an informed consent. The study received ethical approval (HUCFF-143/01). Mean values were compared using the Mann–Whitney test and ordinal variables using the χ^2-test for trend. The association of independent variables with the annual risk of infection (ARI) was tested in a multivariate model which included variables with a marginally significant ($P \leq 0.10$) association in univariate analysis.

Among 1032 participants, TST1 was positive in 6.9% (95% confidence interval: 5.4–8.6) and boosting was present in a further 8.4% (6.5–10.6).[5,6] Among 707 eligible students, 518 (73.3%) consented to participate and underwent TST3. A total of 458 (88.4%) returned for TST reading, of whom 144 (31.4%) reported nosocomial exposure to TB. Conversion was identified in 13 students [2.8% (1.5–4.8)], corresponding to an ARI 3.1 (1.8–5.2) per 100 person-years. Eight out of 13 students who converted had known nosocomial TB exposure [hazard ratio = 9.3 (95% confidence interval: 2.0–42.9)] (Table I). Conversion was associated with clinical years and TB incidence in the city in univariate analysis, but not in multivariate analysis. Nosocomial contact with TB patients was the only variable independently associated with conversion. Among the 13 students who converted, none had clinical or radiological evidence of active TB, four accepted treatment with isoniazid and three completed therapy.

We confirmed the high vulnerability of medical students to TB transmission, previously described by others.[2,7] The ARI was high, when compared to the general population. In this population, with a high socio-economic background, we estimate that the ARI with TB during childhood and adolescence was 0.3% based on the measured prevalence of 5.2% TST1 positivity when starting medical school.[4] Our findings represent an ARI attributable to TB nosocomial exposure of 2.8% yearly. The high ARI found in this study was considered to be due to occupational exposure because domiciliary exposure was rare and the incidence rate in the community was not an independent associated risk factor. Even in low TB incidence countries, nosocomial transmission of TB is well documented.[1]

In previous studies done in similar populations, the TB ARI attributable to nosocomial exposure varied from 2.6% in India to 11.3% in Peru.[2] In Brazil, the attributable ARI was higher among HCWs (8.2%) and nursing students (5.4%), but similar among medical students.[2] The present study is the first to assess multiple possible risk factors, including cities with different TB incidences. Because the outcome event was rare, however, other associations were difficult to explore.

The strengths of our study include the large number of participating students; low rates of loss to follow-up; highly

Table I
Tuberculin skin test conversion among 458 medical students, Brazil, Rio de Janeiro, 2002–2004

Characteristics	Conversion ($N = 13$)	No conversion ($N = 445$)	HR (95% CI)	*P*-value[a]	aHR (95% CI)
Age, years, mean (SD)	22.0 (2.8)	21.7 (2.4)	–	NS	–
Sex					
Female	10 (3.9%)	249 (96.1%)	1		
Male	3 (1.5%)	196 (98.5%)	0.4 (0.1–1.5)	NS	–
Clinical years					
Preclinical	6 (3.8%)	150 (96.2%)	1		
Early clinical	3 (1.6%)	187 (98.4%)	0.8 (0.2–3.5)	NS	1
Late clinical	4 (3.6%)	108 (96.4%)	8.3 (1.7–40.5)	0.009	2.2 (0.3–15.1)
TB incidence per 100 000 inhabitants in the city					
Low (28)	1 (1.8%)	54 (98.2%)	1	NS	1
Intermediate (63)	5 (2.9%)	165 (97.1%)	4.8 (0.5–42.6)	0.088	
High (114)	7 (3.0%)	226 (97.0%)	0.4 (0.1–1.2)		0.1 (0.01–1.2)
Nosocomial TB exposure					
No	3 (1.2%)	245 (98.8%)	1		1
Yes	8 (5.6%)	136 (94.4%)	9.3 (2.0–42.9)	0.004	12.8 (2.4–69.1)
Unknown	1 (1.9%)	51 (98.1%)	–		–
Missing	1 (7.1%)	13 (92.9%)	–		–

HR, hazard ratio; aHR, adjusted hazard ratio; CI, confidence interval; NS, not significant; TB, tuberculosis.
[a] From univariate analysis.

trained TST readers; and the false conversions ruled out by a two-step baseline TST. The main limitation was the use of TST conversion as a marker of recent LTBI because of its low specificity in BCG-vaccinated populations. Nevertheless, while longitudinal studies with interferon-γ release assays are awaited in TB high burden countries, TST conversion is still considered a reliable marker of recently acquired LTBI if a two-step baseline TST is performed.[8]

Altogether, our results demonstrate that medical students are at risk for occupational TB infection and should be carefully followed for LTBI detection and, where required, treatment. Infection control measures should be implemented in healthcare facilities to reduce HCWs' risk. Students should be aware of their risk and be encouraged to adopt protective measures to reduce nosocomial transmission.

Conflict of interest statement
None declared.

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Does 'airborne' hydrogen peroxide kill *Mycobacterium tuberculosis*?

Madam,

Our report on the failure of dry mist hydrogen peroxide 5% to kill *Mycobacterium tuberculosis* drew some important comments from Otter and Yezli.[1,2] First, the terminology concerning gaseous or mist disinfection may be confusing. According to Wikipedia, vapour is 'a substance in the gas phase at a temperature lower than its critical temperature and may co-exist with a liquid (or solid) in a state