Evaluation and follow-up of infectious tuberculosis at the University of Ottawa

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ZA MEMISH, R HICKEY, I GEMMILL. Evaluation and follow-up of infectious tuberculosis at the University of Ottawa. Can J Infect Dis 1995;6(5):239-243. A case of active infectious pulmonary tuberculosis (TB) in a recent immigrant to Canada was identified at the University of Ottawa. The student was attending classes regularly and coughing for six months before the diagnosis of infectious pulmonary TB was made. Investigation carried out by the Ottawa-Carleton Health Department identified 871 student contacts. Of the 871 contacts, 773 (89%) were available for testing and follow-up. Initial skin testing with purified protein derivative (PPD) was positive in 149 contacts. Of the 602 contacts testing negative initially 399 (66%) returned for 12-week retesting. Eleven skin test converters were identified. All 160 contacts with positive PPD had negative chest x-ray and were given isoniazid prophylaxis for six months. The estimated cost of the process of contact tracing, testing, follow-up and treatment was \$34,036. Although pre-immigration screening policies for TB do exist, additional pre- and postimmigration measures could help in the early detection of active TB and the prevention of its spread.

Key Words: *Contact follow-up, Immigration, Tuberculosis*

Évaluation et suivi de la tuberculose infectieuse à l'Université d'Ottawa

RÉSUMÉ : Un cas de tuberculose (TB) infectieuse active chez un immigrant de fraîche date a été identifié à l'Université d'Ottawa. L'étudiant a régulièrement assisté à ses cours et a toussé pendant six mois avant que le diagnostic de TB pulmonaire infectieuse ait pu être posé. L'enquête épidémiologique menée par le département de santé publique d'Ottawa-Carleton a identifié 871 contacts parmi les étudiants. De ce nombre, 773 (89 %) étaient disponibles pour subir une épreuve de dépistage et un suivi. Les premières épreuves de tuberculines purifiées (PPD) se sont révélées positives chez 149 contacts. Parmi les 602 contacts dont les épreuves étaient initialement négatives, 399 (66 %) ont subi une autre épreuve après 12 semaines. Onze personnes ont alors vu leur épreuve cutanée se convertir. Les 160 contacts dont le PPD était positif ont subi une radiographie pulmonaire avérée négative et ont reçu un traitement prophylactique par isoniazide pour une durée de six mois. Le coût du processus de retraçage des contacts, des épreuves, du suivi et du traitement est évalué à environ 34 036 \$. Même s'il existe des politiques pour le dépistage de la TB chez les candidats à l'immigration, des mesures pré- et post-immigration additionnelles pourraient faciliter le dépistage précoce de la TB active et empêcher sa propagation.

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IN THE EARLY 1980S, THE CENTERS FOR DISEASE CONTROL (Atlanta, Georgia) set a goal for tuberculosis (TB) eradication by the year 2010 (1). In the last decade of the 20th century, eradication of TB seems less likely and efforts are aimed at controlling its spread. In the United States, the number of new TB cases declined until 1984; the incidence in 1985 was stable but a 16% increase occurred in 1986. Since then, a continuous increase in TB incidence has been noted. This occurrence was attributable in part to the co-infection of some populations with human immunodeficiency virus and *Mycobacterium tuberculosis* (2-4).

In Canada the number of new TB cases has continued to decline since 1984, with only a slight increase noted in 1989 (2.4%), 1991, 1992 and 1993 (5). This increase was related to the influx of immigrants to Canada from third-world countries where TB is endemic and tools for prevention, treatment and control of TB may be lacking.

Between 1867 and 1991, 12,857,883 people arrived in Canada as immigrants. In 1991 alone, 230,781 immigrants were accepted into Canada. The regions of origin were Asia (52%); Europe (20%); Africa (7%); Mexico and Central America (5.8%); South America (4.6%); and the United States (2.9%) (6).

Through immigration, individuals infected with TB in their childhood bring with them this geographical risk factor for disease; with the stress of immigration and personal and social disruption, reactivation is common, especially within five years of immigration (7-11). Overall, the greatest increase in cases of TB in Canada between 1980 and 1990 occurred in immigrants, with substantial decline in the incidence in the non-Native population born in Canada.

The presence of one case of infectious TB may carry the risk of exposing hundreds of healthy individuals to the disease. The follow-up and treatment of contacts is time consuming, expensive and very worrisome to people exposed to TB without their knowledge. This situation raises the question of whether pre-immigration medical policies and procedures provide adequate screening and care to new arrivals and protection to the uninfected in the Canadian population. We review a case of infectious TB in an immigrant to Canada, whose infection was not detected by immigration screening, and who had more than 800 contacts who required testing and follow-up.

CASE PRESENTATION

The index case was a single, 27-year-old female who immigrated to Canada from Vietnam on January 1, 1990. She came from a middle class family and remembered always being healthy. There was no significant past medical history.

The patient remembered having Bacille Calmette-Guérin (BCG) vaccine as a child as did all her family members. As part of the pre-immigration medical examination she and her family members had chest x-rays reported as normal. No TB skin test was done either before or after entering Canada, until late in her illness.

She came with her parents and three siblings to live with her eldest brother who had been in Canada for 13 years. In

August 1992 she entered the University of Ottawa as a full-time student. In September 1992, she started to feel unwell with continuous dry cough; there were no associated shortness of breath, fever or chills. Chest x-ray done at the end of September revealed right lower lobe infiltrate. This condition was treated with four courses of different antibiotics over three to four months with minimal improvement.

On February 25, 1993 she was reassessed for persistent clinical symptoms and chest x-ray abnormalities. A skin test with five purified protein derivative (PPD) test units was done and was positive at 22 mm. Sputum showed numerous acid-fast bacilli and TB cultures were initiated. The patient was assessed by a respirologist for treatment on March 5. Quadruple therapy with isoniazid, rifampin, pyrazinamide and ethambutol was started. Three subsequent sputum samples were negative for acid-fast bacilli. The final culture report of sputum was positive for *M tuberculosis*, sensitive to all anti-TB drugs.

The index case had attended classes regularly since the beginning of the school year. She was not able to identify regular contacts at school and stated that she sat at different places at different times in her classes. The auditoria hold about 125 students and the classrooms hold about 50 students each. There is central ventilation but no windows in these rooms. The air circulates back to other classes with a partial fresh air exchange.

She also took local buses to and from the university. The total travelling time was 45 mins with no transfers. During the winter, all bus windows were kept closed.

HEALTH DEPARTMENT INTERVENTION

The Health Department was notified immediately of positive sputum smears by the respirologist. The following interventions were implemented:

- The patient was excluded from the university and confined to home for three weeks after initiation of quadruple therapy with a public health nurse visit twice weekly to ensure compliance with treatment and to educate the patient about the disease.
- Screening of family contacts revealed that of four household contacts, only one sister had positive PPD (11 mm) but negative chest x-ray. She was treated with isoniazid for six months.
- The University Health Services medical director was contacted and informed of the situation, and arrangements were made for a skin testing clinic to be held on campus for all 871 contacts. Health Department staff ran the clinic with assistance from the University Health Services.
- A letter was written to the Dean of the Department in which the patient was registered to request formally the list of names, dates of birth, temporary and permanent addresses and telephone numbers of contact students sharing the same classes.
- A letter was formulated by the University and

Figure 1) Results of tuberculosis follow-up at the University of Ottawa. PPD Purified protein derivative

distributed to every student in any class with the index case. This letter gave information on why the test was needed and when it would take place.

- To ensure compliance with testing, the University decided that students would not receive their examination results until they had provided proof of follow-up to their TB exposure.
- Two-step PPD testing was done only for those who were over 35 years of age; who had previous history of BCG vaccine or previously had positive Mantoux tests PPD; or who had spent more than three months in an endemic area.
- Contacts who did not attend the clinics were sent a letter by the University telling them to make arrangements with their doctor for testing and forwarding of results to the Health Department.
- All contacts who were negative on the first test were given a letter with the date of final testing 12 weeks later, and instructions for the physician to send the result to the Health Department.
- All contacts with a positive Mantoux test were referred to University Health Services or their own doctor with a copy of the Health Department recommendations for assessment and isoniazid prophylaxis. A request was made to inform the Health Department of the course of action taken.
- Contacts with positive Mantoux test were contacted by public health nurses at least every three months to ensure compliance with isoniazid prophylaxis and medical follow-up.

- Contacts who had left the region were referred to the appropriate health unit for follow-up.

RESULTS

The total number of contacts identified through the surveillance was 871 (Figure 1). This number included all students who attended classes with the index case in the same room for more than 45 mins on multiple occasions. Because it was impossible to determine accurately who was most closely exposed to the index case over the six-month period, all students were included according to the criteria noted. Of the total 871 contacts, 773 (89%) complied with testing and follow-up. Ninety-eight contacts had no testing. Nine people who had had a positive Mantoux test within the previous five years or who had had a previous severe reaction to testing had chest x-rays. All of these chest x-rays were negative.

The results of the first PPD testing showed 149 positives out of 764 tested (19.5%). Two-step testing was done for 144 contacts meeting the criteria. Of those, 13 had positive reactions.

Retesting after 12 weeks was done in 399 contacts; 11 conversions (2.8% of those retested) were documented. This figure is the best indication of transmission. Two hundred and three students did not have final testing despite the University policy.

The estimated total cost of the process of contact tracing, testing, follow-up and treatment was \$34,036. Table 1 summarizes the expenses.

DISCUSSION

This intervention was complex, time consuming and expensive. Despite all efforts 98 (11%) contacts were not tested,

TABLE 1
University of Ottawa clinic costs

Item	Amount (\$)	Total cost (\$) (actual or estimated)
Nursing time	768.5 h	17,783.09
Clerical time	20.5 h	387.90
Mileage and parking		1,703.64
Printing	4000 copies	320.00
Supplies		1,757.11
Medical follow-up		
First visit for isoniazid to physician		3,472.00
Chest x-rays	170 units	7,250.00
Isoniazid	160 units	956.80
Vitamin B6		406.00
Total		34,036.54

University of Ottawa printing costs, the time for public health nurse home visits and telephone calls are not accounted for in these figures

and 203 (23%) of the contacts requiring Mantoux retesting at 12 weeks did not return.

All the 162 contacts who had a positive Mantoux test initially had normal chest x-rays and it could not be determined with certainty whether the positive skin tests were related to the index case or to previous exposure in an endemic country. All these students were given isoniazid prophylaxis as recommended by the Canadian Lung Association and American Thoracic Society (12).

The 11 skin converters at 12 weeks are probably related to the index case. All of them had a negative chest x-ray and were given isoniazid prophylaxis. Since there were 203 students who did not return for the 12-week retesting, it cannot be determined how many additional students converted and whether any secondary case may have resulted from this incident.

This case calls into question current immigration medical requirements. The immigration examination includes taking a history; physical examination; chest x-ray if the applicant is older than 11 years; urinalysis if the applicant is older than five years; and serological testing for syphilis if the applicant is older than 15 years (13-15). The history-taking and physical examination are done by a local physician in the country of origin appointed by the Department of Citizenship and Immigration. The accuracy and quality of this assessment varies and the laboratory testing may be misinterpreted or misrepresented; both poor quality chest x-ray and fraudulently represented chest x-ray occur. These tests are done outside Canada and the medical findings are reviewed by a Canadian medical officer. TB, especially in people coming from endemic areas, may be incubating or dormant and may not be detected by these screening methods.

The tuberculin skin test is not included in the Canadian recommendation for immigration TB screening, although it is a predictor for the development of TB over time. Those with inactive TB are admitted with notification to provincial TB control. Local health units may receive these reports months after im-

migration, often too late to find the individual or after TB has already reactivated. Applicants are deferred until satisfactory treatment has been administered for infectious TB or syphilis. No attempt is made to assess ongoing risk for TB by skin testing. This procedure is felt to be too difficult for applicants and to identify too many positives.

We therefore offer the following recommendations for immigration medical screening. First, TB skin testing on arrival by Canadian medical officers to assess risk for future TB in both immigrants and refugees; second, referral of positives expeditiously to local health units, with a requirement for the refugee or immigrant to follow up with their health unit; and finally, a review of current infectious disease screening to provide immigration screening based on incidence and the practicality of intervention. Infections such as hepatitis B and others should be considered for inclusion. The health of the individual and the protection of Canadians should both be given priority.

As TB makes a resurgence in communities settled by people with geographical risk factors for this disease, primarily the largest urban centres in Canada, better screening for this and other diseases is required. With new patterns of immigration, a predictable number of new infectious TB cases will occur, sometimes in a large risk setting such as high school or university. More comprehensive screening and follow-up will benefit the affected individuals through earlier intervention and less reason for backlash against populations at risk for TB; it will benefit the Canadian public through reduced risk of exposure to infectious disease; and it will benefit institutions in which cases occur through less disruption. A full review of the infectious disease component of the immigration medical examination is required to benefit all these groups and to satisfy the requirements of the Immigration Act.

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