Brief Report

Tuberculosis among health care workers in a Brazilian tertiary hospital emergency unit

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Abstract The Brazilian emergency system is being reorganized as a hierarchy in the region of Ribeirão Preto, state of São Paulo. We found increased occupational risk for tuberculosis in this region tertiary reference center—a nurse technician (Incidence rate [IR] 526.3/100 000 inhabitants) had a risk of tuberculosis 12.6 (95% confidence interval [CI], 2.57-37.23) greater than the city population (41.8/100 000 inhabitants). The system reorganization will have to make the centers adequate to deal with this problem.
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1. Introduction

Hospital emergency units (EUs) serve as the frontline for patients with some relevant public health communicable respiratory diseases [1]. Increased risk among health care workers is evident, and several measures to reduce this burden are recommended [2]. Among these diseases, tuberculosis is often forgotten because of its prevalence, chronic nature, and the difficulties for a proper and immediate diagnosis on site [2-4].

One potential aggravating factor is the health care system organization. In Brazil, this system has been recently organized to work in an hierarchy, which changed the emergency referral system of the city of Ribeirão Preto (state of São Paulo) [5]. However, as it is designed to refer complex cases to tertiary reference center, it can potentially increase the nosocomial and occupational risk of tuberculosis if these facilities are not properly structured.

Tuberculosis is still a public health concern in Ribeirão Preto, with an incidence rate of 41.8 per 100 000 inhabitants for the year 2001. The Emergency Unit of the University Hospital of the Ribeirão Preto Medical School, University of São Paulo (EU-UH-RPMS-USP), which is a tertiary reference center for the city of Ribeirão Preto and 23 smaller cities, reported 33 new cases of tuberculosis out of 35 415 patient visits in 2001 (incidence rate of 93.2/100 000 patient visits; 95% CI, 64.1-130.8), representing an increase in comparison to the year 2000 (incidence rate of 47.5/100 000 patients visits; 95% CI, 27.7-76.1).

Based on increased-risk patients who were referred to the EU-UH-RPMS-USP, this study was designed to evaluate the

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patients' characteristics to better understand the occupational risk of tuberculosis and to determine the incidence of the disease among health care workers in the EU-UH-RPMS-USP, in comparison with health care workers of other institutions and with the general population.

2. Methods

We performed a prospective analysis of the 94 patients notified as possible cases of tuberculosis during the year 2002, following the recommendations of the World Health Organization [6]. We also gathered information of all the health care professionals notified as cases during 2001 in the city of Ribeirão Preto, identifying those who worked in the EU-UH-RPMS-USP, and calculated the incidence rates and relative risks for comparison. The analysis was performed using Stata Intercooled version 9.2 (StataCorp, College Station, Tex) [7].

3. Results

In 2002, 94 patients were notified as possible cases of tuberculosis based on epidemiologic background, clinical, and laboratorial findings (suggestive history of tuberculosis with pulmonary condensation or positive baciloscopy), and 33 (35.1%) were later confirmed by sputum culture. These patients were mainly adults (87.5%) and had a significantly proportion of concomitant HIV infection (31.4%); 20% were in respiratory distress at presentation, requiring ventilator therapy, and 26.6% died during the hospitalization (8 of them [8.5%] during the first 24 hours after arrival). Only 19 patients (20.2%) could be discharged for outpatient treatment, and transfer to another hospital facility was implemented for 12 patients (12.7%). Most of these patients were admitted under the internal medicine staff responsibility (71.1%), and most of them (79.9%) had the hypothesis of tuberculosis raised at arrival.

The Tuberculosis Control Program of the city of Ribeirão Preto documented 21 cases among health care workers from October of 1997 to January of 2003, including 3 physicians, 15 nurse technicians, 1 nurse, 1 phonoaudiologist, and 1 psychologist. Because of the limitation of the number of cases for the other health worker categories, we focused on the nurse technicians diagnosed in 2001 (5 in total; 3 of the EU-UH-RPMS-USP). Using the estimated population for the city (514 160), the population of nurse technicians for the whole city (4520) and for the EU-UH-RPMS-USP (570) for 2001, we calculated the incidence rates of tuberculosis. The value for the city nurse technicians (110.6/100 000 inhabitants) was 2.64 (95% CI, 0.85-6.27) times greater

than that estimated for the whole-city inhabitants (41.8/100 000 inhabitants). A nurse technician who worked in the EU-UH-RPMS-USP (IR 526.3/100 000 inhabitants) had a risk of tuberculosis 12.6 (95% CI 2.57 – 37.23) greater than the city population. The comparison of the incidence rate of those nurse technicians who worked in the EU-UH-RPMS-USP (3 professionals) with those who did not work at this hospital (2 professionals, IR 50.6/100 000) revealed a relative risk of 10.4 (95% CI, 1.19-124.4).

4. Discussion

The patients notified as tuberculosis (suspected or confirmed) cases in the EU-UH-RPMS-USP had severe disease presentation and elevated mortality, which reflects referral patterns to the tertiary center. Every month, the EU receives 5 to 7 new suspected cases, and ideally, these patients should be isolated until a proper diagnosis is made. Nevertheless, the elevated permanence of suspected cases in the EU creates concerns and could be explained by several factors [8-10]. First, it can be attributed to failure of the administrative measures for respiratory isolation of suspected cases [4]. Second, the number of respiratory isolation beds could be insufficient because most of these patients have an elevated hospital stay, and their critical respiratory condition preclude them to be transferred to another hospital. Third, it could reflect previous inadequate structural conditions of the respiratory isolation facilities —the EU is an old building (dated from the 1950s), and only recently negative pressure and high efficiency particulate air (HEPA) filters were implemented in the 2 beds destined for respiratory isolation. Finally, delay in the diagnosis could postpone isolation, which seems to be less of the problem, because most of these patients were diagnosed at admission. Further research to evaluate the number of beds needed to deal with this problem must be performed.

Although a definitive causal relationship between this highly selected and severely ill population with an increased occupational risk cannot be made, the incidence rate and relative risk of the nurse technicians who work in the EU-UH-RPMS-USP creates concerns. The World Health Organization guidelines [4] describe a risk 8 times greater for health care professionals, but no differentiation is done according duration or intensity of exposure, which could explain the greater relative risk of the EU-UH-RPMS-USP nurse technicians. The nurse technicians included in our study population were not different from the general population regarding potential confounding (economics, living arrangements, and HIV infection) but worked more than 30 h/wk on average with patients with characteristics similar to the previously described. This prolonged exposure is the most important risk factor for occupational tuberculosis [4] and should be targeted for

measures of control. Information about individual nurse technician exposure was not obtained, but all of them worked in similar conditions without any particular incident or special situation notified to the hospital administration. Besides all the nosocomial and occupational risk that nurse technicians could represent, several of these professionals work in different hospitals in the city, and they could become a vector for disseminating the disease among hospitals.

Evaluating the incidence of occupational tuberculosis risk could be very difficult because there could be underreporting, and we are only documenting cases severe enough to seek medical evaluation. In addition, the elevated prevalence of tuberculosis among the population could raise the hypothesis that the disease was acquired out of the hospital, and this is certainly a limitation of our study.

Several measures to solve this problem have already been implemented, including administrative (strengthening the internal policy for isolation of suspected cases), environmental control (increasing the number of isolations beds), and individual protection (N95 filter masks). The impact of these measures will have to be reevaluated in the future.

In summary, the organization of the health care system can have several advantages for better use of resources, but the referral centers should be properly structured, and administrative and individual protection measures should be implemented to deal with the occupational risk for tuberculosis.

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