

Research article

Increased risk of tuberculosis in health care workers: a retrospective survey at a teaching hospital in Istanbul, Turkey

Caglar Cuhadaroglu*, Mustafa Erelel, Levent Tabak and Zeki Kilicaslan

Address: Department of Chest Diseases, Istanbul Faculty of Medicine, University of Istanbul, Istanbul, Turkey

E-mail: Caglar Cuhadaroglu* - cuhad@turk.net; Mustafa Erelel - merelel@yahoo.com; Levent Tabak - tabakl@ixir.com.tr; Zeki Kilicaslan - zkilicaslan@eskortnet.com.tr

*Corresponding author

Published: 26 July 2002

Received: 18 March 2002

BMC Infectious Diseases 2002, 2:14

Accepted: 26 July 2002

This article is available from: <http://www.biomedcentral.com/1471-2334/2/14>

© 2002 Cuhadaroglu et al; licensee BioMed Central Ltd. This article is published in Open Access: verbatim copying and redistribution of this article are permitted in all media for any non-commercial purpose, provided this notice is preserved along with the article's original URL.

Abstract

Background: Tuberculosis (TB) is an established occupational disease affecting health care workers (HCWs). Determining the risk of TB among HCWs is important to enable authorities to take preventative measures in health care facilities and protect HCWs. This study was designed to assess the incidence of TB in a teaching hospital in Istanbul, Turkey. This study is retrospective study of health records of HCWs in our hospital from 1991 to 2000.

Results: The mean workforce of the hospital was 3359 + 33.2 between 1991 and 2000. There were 31 cases (15 male) meeting the diagnostic criteria for TB, comprising eight doctors, one nurse and 22 other health professionals. Mean incidence of TB was 96 per 100,000 for all HCWs (relative risk: 2.71), 79 per 100,000 for doctors (relative risk: 2.2), 14 per 100,000 for nurses and 121 per 100,000 (relative risk: 3.4) for other professionals. The mean incidence of TB in Turkey between 1991 and 2000 was 35.4 per 100,000. Incidence of TB was similar in the Departments of Chest Diseases and Clinical Medicine but there were no TB cases in the Basic Science and Managerial Departments.

Conclusion: HCWs in Turkey who work in clinics have an increased risk for TB. Post-graduate education and prevention programs reduce the risk of TB. Control programs to prevent nosocomial transmission of TB should be established in hospitals to reduce risk for HCWs.

Background

Tuberculosis (TB) is an established occupational disease of health care workers (HCWs) and those infected may transmit the disease to susceptible individuals. Previously, it has been reported that HCWs are at increased risk of TB [1–6]. There is a large number of studies from North America about the risk of TB among HCWs and TB control programs have been established to protect HCWs in these countries. Prevalence of TB among HCWs in high-prevalence countries has been poorly documented [4–6] and

TB control programs are not widespread. Turkey is one such country and had a TB incidence of 26.3 per 100,000 in 2000 [7]. Also, in Turkey there is no central control program for the prevention of TB in HCWs. Determining the risk of TB among HCWs is important to enable authorities to take preventative measures in health care facilities and protect HCWs.

In the present study, we aimed to determine whether HCWs in a Turkish teaching hospital have a higher risk of

TB than the normal population and if the incidence of TB varies between hospital departments.

Methods

This retrospective study was performed at the bed acute care hospital of the Istanbul Medical Faculty. We reviewed health records of HCWs from 1991 to 2000, obtained from the Department of Chest Diseases and Human Resource Department archives. TB is diagnosed by bacteriological culture or histological evidence of granuloma with caseification necrosis or clinical findings consistent with active TB (fever, sputum, malaise, fatigue, loss of appetite, weight loss, night sweats) and full course of chemotherapy is indicated for these patients.

Demographic data for HCWs were provided by the Human Resources Department of the hospital. Population in December was taken as the study population for each year. Incidence rates of TB for Turkey's general population were taken from the annual statistics report of the Ministry of Health [7].

The Department of Chest Disease was evaluated separately from the Department of Medicine. The Department of Basic Science was including laboratories as Microbiology, Pathology, Pharmacology, Biochemistry, Forensic Medicine and Physiology. Managerial department and services were including the Dean's Office, Human Resource Office, laundry, central kitchen, mechanics, central heating unit, accommodation and student affairs

Results

Between 1991 and 2000 the mean work force of the hospital was 3359 ± 33.2 , consisting of 879 doctors, 670 nurses and 1810 allied health professionals. There were 31 cases (15 male, 16 female) meeting the diagnostic criteria for TB. Thirteen cases were confirmed by sputum culture and one by urine culture, eight cases were verified by histological examination, and nine patients showed findings consistent with active pulmonary TB. The 31 cases of TB comprised eight doctors, one nurse and 22 other health professionals. Mean age was 35 (range: 22–50) for doctors, 27 for nurse and 25.7 (range 19–58) for other professionals. All of the TB patients had worked as an HCW for at least 12 months.

Twenty three of the cases were pulmonary TB and 8 were extra-pulmonary. In the pulmonary TB patients, chest x-ray revealed typical lung parenchyma pathology. There were no cases of active TB in the families of HCWs.

Mean incidence of TB for 1991 to 2000 was 96 per 100,000 for all HCWs (relative risk: 2.71), 79 per 100,000 for doctors (relative risk: 2.2), 14 per 100,000 for nurses and 121 per 100,000 (relative risk: 3.4) for other profes-

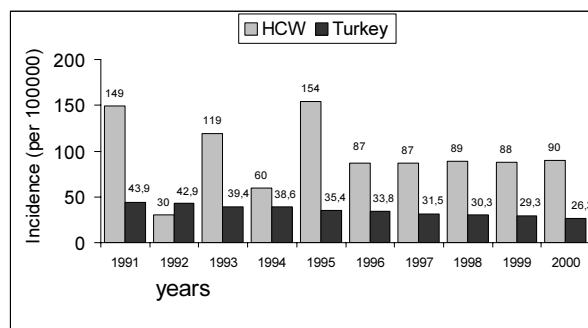


Figure 1

The comparison of the incidence of tuberculosis for health care workers (HCWs) and the general population by years. Between 1991–2000, mean incidence of Tuberculosis for HCWs is three times more than general population

sionals. Mean incidence of TB for Turkey as a whole was 35.4 per 100,000 [7]. Fig. 1 shows the incidence of TB in our study and in the general population.

Incidence rates were similar in the Departments of Chest Diseases (151 per 100,000) and Medicine (157 per 100,000). Incidence in the Department of Surgery was lower, at 107 per 100,000. There were no cases of TB in the Basic Science and Managerial Departments.

Discussion

In our study the results indicated that the incidence of TB among hospital staff was approximately three times more than that in the general population of Turkey. Previous studies made by Turkish hospitals also showed that risk of TB among HCWs was higher than in the general population [8].

The demographic characteristics of TB cases among our hospital HCWs were different from the general population. In Turkey, it has been shown that TB is more common among persons with a mean age of 37.5 years (range 20–39) and 85% of patients are male [9]. However, in our hospital staff, the mean age of TB patients was 27.7 years and 50 % of them were female. These differences support the idea that TB in HCWs was of nosocomial origin.

There are two limitations in our study. First, we do not have information about staff that left the hospital to pursue another occupation. Our data was limited to the time that they worked in the hospital. The second limitation concerns the incidence rates of TB in the general population. We accepted the Ministry of Health figures but we estimate that the reported incidence rates are less than the

true rates due to the deficiency in registering TB cases in Turkey.

Those that have investigated TB infection risk by tuberculin testing have shown that HCWs have a higher infection risk than the normal population [1–3]. In Turkey, BCG vaccination is routinely given twice in a person's life; at birth and at 7 years of age. As a result, tuberculin skin test surveys are not relevant for Turkey. All of the HCWs in our study had been vaccinated at least once.

Previous studies from other countries have demonstrated different results for TB in HCWs [4–6,8,10–16]. Kruuer *et al.* showed that TB risk in Estonia was higher for HCWs than the rest of population [4]. Similar results have been found in Serbia [5], Malawi [6], Japan [10], North America and Western Europe [12–14]. However, two studies had different findings [15,16]. Firstly, in the UK, McKenna showed that risk of TB among HCWs was similar to that of the general population. Secondly, Raitio found that the overall risk of TB among HCWs was lower than in the general population. The incidence of TB in Turkey in 2000 of 26.3 per 100,000 is lower than the rates in Estonia, Malawi and Serbia but higher than North America and Western Europe. Nevertheless, our results are in line with those of other countries.

In Turkey there is no specific TB prevention program for HCWs. There are several chest clinics where HCWs and TB patients use surgical masks but there is only one clinic which has negative ventilation for its TB ward. In North America, on the other hand, TB prevention programs for HCWs have been established and performance is regularly controlled [17]. In spite of this structural difference, the similar, higher TB risk for HCWs in Turkey and North America is significant. In our Department of Chest Diseases, the last TB case in an HCW was in 1991. Surgical masks have been used in the department since 1992. A separate TB ward was set up in 1996 and in 1998 it was fitted with a central negative ventilation system. We observed that in other hospital departments, with the exception of nurses, staff did not take precautions against TB. The incidence of TB among nurses was very low in comparison with other staff. All the nurses in our hospital have a regular post-graduate education program but the doctors and other staff do not. We speculate that the low incidence of TB in nurses is dependent on this regular education. TB is still a disease that affects low income groups in Turkey. The level of income for HCWs is higher than the poverty threshold. Indeed, the incidence of TB in that income group would have been expected to be lower than in the general population.

Unfortunately, we do not have detailed information about TB in Turkey that takes account of different income

Table 1: The Incidence of tuberculosis: differences between departments. * the incidence per 100000

	Academics*	Nurse*	Other professionals*
Surgery	75 (n:3)	25 (n:1)	197 (n:10)
Pediatrics	0	0	149 (n:2)
Chest	0	0	500 (n:1)
Medicine	200 (n:4)	0	186 (n:7)
Basic Science	0	0	0
Management	0	0	24 (n:1)

levels. However, we predict that TB incidence in nurses in our hospital will be similar to non-medical personnel who have the same income as HCWs. Two other factors may account for the different TB risk in nurses compared with other health professionals. Nurses usually work in wards where it is known if a patient has TB, therefore, nurses can take steps to protect themselves against infection. Doctors and other health professionals work in outpatient and several other departments at the same time. In these circumstances there may be patients with undiagnosed TB, leading to increased risk of infection.

Although the risk of TB was higher in all clinical specialties than in the general population, the incidence of TB in surgery and pediatrics was lower than in other clinical departments. This could be because TB patients are not usually admitted for surgery and transmission of TB from children is unusual. There have been no TB cases in the Basic Science Department for last ten years, even though this department has both pathology and microbiology laboratories. However, adult autopsies have been performed rarely in the pathology laboratory since 1991. The microbiology laboratory performs a limited number of sputum examinations for *Mycobacterium tuberculosis*, given that there is another specialized laboratory in Istanbul for this purpose.

Conclusions

HCWs in Turkey, especially those working in clinics, have an increased risk for TB. Post-graduate education and preventative measures reduce the risk of TB. Control programs to prevent nosocomial transmission of TB should be established in hospitals to reduce the risk for HCWs.

List of abbreviations

HCWs: Health care workers

TB: Tuberculosis

Competing

None declared

Authors' contributions

Authors 1 initials carried out the all archives research in medical department, performed statistical analyses and write manuscript. Authors 2 : contact with human resource department and collect data of health care workers. Author 3 participate the writing of manuscript and revised it. Author 4 revised article, coordinated all study and get official permission for archives research.

All authors read and approved the final manuscript.

References

- Louther J, Rivera P, Feldman J, Villa N, DeHovitz J, Sepkowitz KA: **Risk of tuberculin conversion according to occupation among health care workers at a New York City hospital.** *Am J Respir Crit Care Med* 1997, **156(1)**:201-5
- Do AN, Limpakarnjarat K, Uthavivoravit W, Zuber PL, Korattana S, Binkin N, et al: **Increased risk of Mycobacterium tuberculosis infection related to the occupational exposures of health care workers in Chiang Rai, Thailand.** *Int J Tuberc Lung Dis* 1999, **3(5)**:377-81
- Stuart RL, Bennett NJ, Forbes AB, Grayson ML: **Assessing the risk of tuberculosis infection among healthcare workers: the Melbourne Mantoux Study.** *Melbourne Mantoux Study Group.* *Med J Aust* 2001, **174(11)**:569-73
- Kruuner A, Danilovitsh M, Pehme L, Laisaar T, Hoffner SE, Katila ML: **Tuberculosis as an occupational hazard for health care workers in Estonia.** *Int J Tuberc Lung Dis* 2001, **5(2)**:170-6
- Skodric V, Savic B, Jovanovic M, Pesic I, Videnovic J, Zugic V, et al: **Occupational risk of tuberculosis among health care workers at the Institute for Pulmonary Diseases of Serbia.** *Int J Tuberc Lung Dis* 2000, **4(9)**:827-31
- Harries AD, Nyirenda TE, Banerjee A, Boeree MJ, Salaniponi FM: **Tuberculosis in health care workers in Malawi** *Trans R Soc Trop Med Hyg* 1999, **93(1)**:32-5
- Ministry of Health Statistic Service: **Statistics of Tuberculosis in Turkey 2001** [http://www.saglik.gov.tr/istatistik.htm]
- Kılınç O, Uçan ES, Çakan A, Ellidokuz H: **İzmir'de Sağlık Çalışanları Arasında Tüberküloz Hastalığı Riski: Tüberküloz Meslek Hastalığı Olarak Kabul Edilebilir mi?** *Toraks Dergisi* 2000, **1(1)**:19-24
- Aktogu S, Yorgancioglu A, Cirak K, Kose T, Dereli SM: **Clinical spectrum of pulmonary and pleural tuberculosis: a report of 5,480 cases.** *Eur Respir J* 1996, **9(10)**:2031-5
- Usui T, Yamanaka K, Nomura H, Tokudome S: **Elevated risk of tuberculosis by occupation with special reference to health care workers.** *J Epidemiol* 2000, **10**:1-6
- Meredith S, Watson JM, Citron KM, Cockcroft A, Darbyshire JH: **Are healthcare workers in England and Wales at increased risk of tuberculosis?** *BMJ* 1996, **313(7056)**:522-5
- Hill A, Burge A, Skinner C: **Tuberculosis in National Health Service hospital staff in the west Midlands region of England, 1992-5.** *Thorax* 1997, **52(11)**:994-7
- Burrill D, Enarson DA, Allen EA, Grzybowski S: **Tuberculosis in female nurses in British Columbia: implications for control programs.** *Can Med Assoc J* 1985, **132(2)**:137-40
- Menzies D, Fanning A, Yuan L, Fitzgerald M: **Tuberculosis among health care workers.** *N Engl J Med* 1995, **332(2)**:92-8
- McKenna MT, Hutton M, Cauthen G, Onorato IM: **The association between occupation and tuberculosis. A population-based survey.** *Am J Respir Crit Care Med* 1996, **154(3 Pt 1)**:587-93
- Raitio M, Tala E: **Tuberculosis among health care workers during three recent decades.** *Eur Respir J* 2000, **15(2)**:304-7
- Centers for Disease control and prevention: **Guidelines for preventing the transmission of Mycobacterium tuberculosis in health-care facilities,** *Fed Regist* 1994, **59(208)**:54242-303

Pre-publication history

The pre-publication history for this paper can be accessed here:

http://www.biomedcentral.com/1471-2334/2/14/prepub

Publish with **BioMed Central** and every scientist can read your work free of charge

"BioMedCentral will be the most significant development for disseminating the results of biomedical research in our lifetime."

Paul Nurse, Director-General, Imperial Cancer Research Fund

Publish with **BMC** and your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours - you keep the copyright



BioMedcentral.com

Submit your manuscript here:

http://www.biomedcentral.com/manuscript/

editorial@biomedcentral.com