

Letters to the Editor

Factors Associated With Tuberculin Conversion Among Staff at a University-Affiliated Hospital

To the Editor:

Early identification of tuberculosis (TB) conversion among hospital workers is the cornerstone by which the quality of TB control measures can be evaluated. Moreover, regular screening identifies newly infected individuals, who are most likely to develop the disease during the 2 years following infection,¹ allowing timely chemoprophylaxis.

The aim of this study was to determine the incidence of, and factors associated with, tuberculin conversion at a university-affiliated hospital.

A retrospective cohort was compiled from staff at the University Hospital Puerta del Mar, Cadiz, Spain, from January 1989 through July 1996. This is an 850-bed tertiary-care facility with a staff of 2,700 and 24,000 admissions per year. Workers were classified as belonging to a high-risk work area if they had been employed for at least 1 year in the infectious diseases, pulmonary, or medicine unit; emergency department; adult intensive-care unit; pathology; or hematology. All 400 staff who were skin-test negative in January 1989 or who tested negative from that date through July 1996 were included in the study.

The test was read by the presence or absence of induration, as determined by palpation, 72 hours after inoculation, and the diameter of the induration was measured. The tuberculin skin-test (TST) conversion rate was defined as representing an increase of 10 mm or more in induration, with respect to that of any test carried out in the previous 2 years. From this information, Kaplan-Meier curves were drawn for each of the independent variables. Log-rank testing was used to compare the incidence density of the conversion among the groups. Cox's

TABLE

CUMULATIVE INCIDENCE AND INCIDENCE DENSITY OF TUBERCULOSIS CONVERSION IN RELATION TO THE INDEPENDENT VARIABLES STUDIED

	Converters	Non-converters	Cumulative Incidence (%)	Incidence Density*
Age				
≤38 y	31	178	14.8	52.2
>38 y	13	178	6.8	16.9
Gender				
Male	16	100	13.8	44.9
Female	28	256	8	27.8
Job category				
Nursing	19	119	13.7	37.1
Nursing auxiliaries	8	93	7.9	20.2
Patient transports	5	20	20.0	68.8
Doctors	2	30	6.2	22.1
Residents	1	18	5.2	30.7
Kitchen staff	4	48	7.7	25.1
Technicians	4	22	15.4	53.5
Other	1	6	14.2	37.3
Work area				
High-risk	29	135	17.7	49.1
Low-risk	15	221	6.3	19.4
BCG vaccination				
Yes	23	167	14.4	33.7
No	18	141	11.3	34.5
Not known	3	48	5.8	18.9
Totals	44	356	11	32.3

Abbreviation: BCG, bacille Calmette-Guérin.

* Per 1,000 person-years.

proportional hazards model then was used. Data analysis was carried out with SPSS 6.0 software (SPSS Inc, Chicago, IL).

The incidence density of TST conversions was 32.3 per 1,000 person-years. Among subjects younger than the median (38 years), conversions were 52.2 per 1,000 person-years. High rates also were found among patient transporters (68.8/1,000 person-years) and technicians (53.5/1,000 person-years). High-risk-area workers also presented a higher incidence: 49.1 per 1,000 person-years (Table). The average age of TST converters was 37.1±5.9 years and of nonconverters was 39.4±8.3 years.

Kaplan-Meier analysis found TST conversion to be significantly

associated with age ($P=.01$), work area ($P=.003$), job category ($P=.012$), and gender ($P=.07$). By Cox regression, age remained a risk factor: those <38 years were at 3.0 times greater risk (95% confidence interval [CI₉₅], 1.5-5.9) than those aged >38. The relative risk was 2.1 (CI₉₅, 1.0-4.5) for patient transporters and technicians, compared to other personnel. Workers in high-risk areas were at 2.1-fold (CI₉₅, 1.1-4.0) higher risk than their colleagues in low-risk areas. No interactions between these variables were detected.

The annual rate of TB conversion among hospital employees (3.2%) was higher than generally found in other hospitals.^{2,3} This may reflect the high number of TB patients attended

and the lack of negative-pressure rooms, high-efficiency particulate air filters, and UV irradiation lamps. It is also necessary to take into account data incidence among the population at large: these amount to 8.7 cases per 100,000 in the United States⁴ and 40 cases per 100,000 in Spain.⁵

Bacille Calmette-Guérin vaccination data did not provide significant results and were not included in the final model. This result could imply an absence of any protection against conversion or the loss of that protection over time.

In conclusion, the incidence of TST conversion at the Puerta del Mar Hospital is high by comparison with other centers. Age, employment in a high-risk work area, and job category all were associated with *Mycobacterium tuberculosis* infection. Our screening and risk reduction programs for hospital staff should take into consideration the risk profiles described in this study.

Dedicated to the memory of Dr. Zarzuela-Ramírez's father, Manuel Zarzuela-Boy.

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REFERENCES

- Centers for Disease Control and Prevention. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care facilities, 1994. *MMWR* 1994;43(RR-13):1-132.
- Liss GM, Khan R, Koven E, Simor AE. Tuberculosis infection among staff at a Canadian community hospital. *Infect Control Hosp Epidemiol* 1996;17:29-35.
- Bowden KM, McDiarmid MA. Occupationally acquired tuberculosis: what's known. *J Occup Med* 1994;36:320-325.
- Tuberculosis morbidity—United States, 1995. *MMWR* 1996;45:365-370.
- Caminero Luna JA. Situación actual de la tuberculosis en España. *Arch Bronconeumol* 1994;30:371-374.

Manuel Zarzuela-Ramírez, MD, MPH

Juan A. Córdoba-Doña, MD, MPH

Hospital Universitario Puerta del Mar
Cadiz, Spain

Emilio Perea-Milla, MD, MPH

Escuela Andaluza de Salud Pública
Granada, Spain

Encarnación Benítez-

Rodríguez, MD, MPH

Antonio Escolar-Pujolar, MD, MPH

Fernando J. López-

Fernández, MD, MPH

Hospital Universitario Puerta del Mar
Cadiz, Spain

Risk of Hepatitis A Among Hospital Personnel in an Intermediate-Endemicity Area

To the Editor:

Hepatitis A virus (HAV) infection has a worldwide distribution, and, like other enterically transmitted infectious diseases, its prevalence is strongly tied to levels of socioeconomic development and standards of hygiene.¹ Results of surveys carried out in countries such as France or Belgium have suggested that healthcare workers are at higher risk of hepatitis A.^{2,3} However, data from other surveys have not demonstrated an increased prevalence of HAV antibody in this group compared with control populations.^{4,5} European Mediterranean countries have been considered classically as areas of moderate endemicity for HAV, where infection occurs mainly in children and young adults.¹ However, epidemiological surveys carried out in recent years in Southern European countries have shown a decrease in the prevalence of antibodies against HAV and a change in the epidemiological pattern of HAV infection.⁶ In fact, the prevalence of anti-HAV antibody has dramatically decreased in Spain in the last 15 years, resulting in a growing proportion of susceptible children and young adults.^{7,8} The aim of this study was to determine whether hospital healthcare workers can be considered as a group at increased risk of hepatitis A in a country with intermediate endemicity of HAV.

The study population included healthy personnel between 18 and 45 years of age at one University General Hospital in Madrid, Spain. All healthcare workers and volunteers with nonhealthcare occupations who were seen by the Preventive Medicine Department for routine health check-ups during 1996 were invited to participate. Information on age, gender, type of occupation, and years of professional activity was recorded. A 10-mL blood sample was collected for anti-HAV antibody determination by an enzyme-linked immunosorbent assay (Abbott Laboratories, Chicago, IL) in the Laboratory of Microbiology of the hospital.

Mean age in years ($\pm$ standard deviation [SD]), mean duration of professional activity in years ($\pm$ SD), and

gender distribution at enrollment were calculated for both groups and were compared by analysis of variance (one-way) and chi-square tests, respectively. The overall prevalence of anti-HAV antibody in the two study groups, as well as the prevalence stratified by age (18-24, 25-31, and >31 years) and duration of activity (1-5 and >5 years), were calculated. The association between the prevalence of anti-HAV antibody and group (healthcare and nonhealthcare), controlled for age and duration of activity, was evaluated by Mantel-Haenszel stratified analysis (two-tailed) with calculation of the odds ratios and their 95% confidence intervals (CI_{95} , Cornfield's method). All statistical analyses were carried out using Epi Info (version 6.5; Centers for Disease Control and Prevention, Atlanta, GA).

A total of 182 subjects were recruited during 1996, 6% of all hospital personnel between 18 and 45 years of age. Of these, 68 (37%) had nonhealthcare occupations (mainly food handlers, cleaning personnel, and maintenance workers) and had a mean age of 31.7 (± 6) years and a mean duration of activity of 9.0 (± 2) years; 36% were male. The remaining 114 (63%) were healthcare workers (physicians or nursing personnel) and had a mean age of 26.6 (± 4) years, and a mean duration of activity of 6.0 (± 1.5) years; 31% were male. Differences between groups in relation to age and duration of activity, but not gender distribution, were statistically significant ($P < .05$).

The prevalences of anti-HAV antibody of nonhealthcare personnel and healthcare workers were 54.4% (CI_{95} , 43%-66%) and 21.9% (CI_{95} , 14%-29%), respectively ($P < .01$). The Table shows the prevalence of anti-HAV antibody found in both groups (healthcare and nonhealthcare) when they were stratified by age and duration of professional activity.

These results show a lower level of anti-HAV prevalence among healthcare workers than among a control group of nonhealthcare personnel, even when age and duration of activity were controlled. The prevalence of anti-HAV antibody in relation to age in this group of physicians and nursing personnel was also lower than that found in samples of the Spanish population of similar age.^{7,8} These results suggest that, in areas where hepatitis A is still moderately endemic, healthcare activity is not a risk factor for HAV infection and that presence of