

## PUBLIC HEALTH

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# Prevalence of Tuberculin Reactivity and Risk Factors for the Development of Active Tuberculosis Upon Admission to a Nursing Home

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**ABSTRACT.** A total of 118 nursing home admissions were studied to determine the prevalence of *M. tuberculosis* infection and the prevalence of risk factors for the development of active tuberculosis. The overall prevalence of positive tests was 22.5%. The most prevalent risk factors for development of active tuberculosis were diabetes mellitus (42.4%), being more than 10% below ideal body weight (41.5%), and alcohol abuse (12.7%). Thirty-four percent of admissions had albumin levels below 3.5

g/dl. No associations were found when logistic regression was used to determine the impact of age and poor nutritional status on the prevalence of positive PPD tests on admission. These results show a substantial difference between the prevalence of positive PPD tests found upon nursing home admissions (22.5%) and the prevalence found previously among residents in the same nursing home (42.9%). *Key words:* Nursing home, Tuberculosis, Tuberculin test, Geriatrics.

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Tuberculosis continues to be an important public health problem. The elderly population has a higher risk for the development of tuberculosis (1-8), and the population of nursing home residents has a risk five to ten times higher than the elderly living in the community. When an active case of tuberculosis develops in a nursing home, the risk for nosocomial spread is also high (2,4,9-12).

In our previous study published in the March issue of this journal (13) we studied tuberculin reactivity and risk factors for the development of active tuberculosis among residents of the Veterans Administration (VA) Medical Center Nursing Home Facility in San Juan, Puerto Rico, from November to December of 1992. In this report we will present the prevalence of positive tuberculin tests and risk factors for active tuberculosis in a population of elderly subjects at the time of admission to the same nursing home.

## Methods

We studied all admissions to the VA Medical Center Nursing Home Facility in San Juan, Puerto Rico, during 1993 excluding short term admissions for respite care. The tuberculin skin test was administered to all nursing home new residents within one week after admission using the Mantoux method (14). All patients with negative results (less than 10mm) were retested in one or two weeks taking into account the possibility of a booster effect(8,15). Medical charts of all subjects were reviewed to obtain basic sociodemographic information and data on risk factors for the development of active tuberculosis (14) in all new admissions (i.e, patients with either positive or negative tests).

Multiple logistic regression analysis (16) was used to determine if age and poor nutritional status (measured by albumin levels below 3.5 g/dl or being more than 10% below ideal body weight) had a significant impact in the prevalence of positive tuberculin tests. Chi-square and Fisher's exact tests (17, 18) were used to test for the presence of significant differences in the prevalence of risk factors between residents with positive and negative tests on admission.

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## Results

A total of 118 subjects were studied. All were male and the median age of the group was 70.5 years old. These results were very similar to those of the total population of nursing home residents described earlier (13). We obtained tuberculin test results for 111 of these patients. We could not obtain the results of 7 patients because either they died or were transferred to the hospital before the test was performed. Including two patients with previous positive tests, the overall prevalence of positive tests upon admission to the nursing home was 22.5% (25/112). Seventeen percent (4/23) of all new reactors were positive after two-stage testing. Multiple logistic regression analysis showed no association of age, serum albumin below 3.5 g/dl, or weight more than 10% below ideal body weight with the prevalence of positive tuberculin tests on admission.

The most common risk factors for the development of active tuberculosis present on admission were diabetes mellitus with 42.4% (50/118), being more than 10% below ideal body weight with 41.5% (49/118) and alcohol abuse with 12.7% (15/118). Forty patients (33.8%) had albumin levels below 3.5g/dl. No clinically or statistically significant differences in risk-factors prevalence were found between positive and negative reactors using chi-square or Fisher's exact tests.

Of the 25 nursing home admissions that presented positive PPD tests, 84.0% (21/25) had at least one criterion that made them candidates for prophylactic therapy with isoniazid (14). The most common criterion was the presence of medical risk factors with 95.2% (20/21).

## Discussion

The overall prevalence of positive tuberculin tests was very similar to the prevalence of positive reactors upon admission to a nursing home found in a larger study in Arkansas (11), but it was substantially lower than the 42.9% prevalence found in our prior study with residents in this nursing home (13). Several factors could account for this higher prevalence of positive tests in long term residents, including early death of anergic debilitated residents, a gradual improvement of the residents' nutritional status and general health improving immune response, or an increase in tuberculin reactivity due to an enhanced anamnestic reaction with repeated testing (19, 21). In the study by Stead et. al. (11), increasing prevalence of positive tuberculin tests was associated with the presence of active tuberculosis cases in the nursing home. However, no cases of active tuberculosis have

been reported in this nursing home.

The prevalence of positive booster reactions was substantial and similar to that reported in previous studies (10, 11, 13, 15, 19-21). We did not perform anergy testing in our subjects, but the higher prevalence of low albumin levels and low body weights among nursing home admissions suggests that this group presented a poorer nutritional status. Poor nutrition has been associated with impaired immune response. However, multiple logistic regression analysis showed no association of age, serum albumin below 3.5 g/dl, or weight more than 10% below ideal body weight with the prevalence of positive tuberculin tests on admission.

In terms of risk factors for the development of active tuberculosis, the prevalence of diabetes mellitus on admission was very similar to that found in the population of nursing home residents (13), but there was a considerably higher proportion of patients presenting weights more than 10% below their ideal body weights (41.5% vs 25.6%) and albumin levels below 3.5g/dl (33.8% vs 15.4%). A possible explanation for this findings is the fact that patients admitted to this nursing home were frequently transferred from the hospital, where they had been admitted due to acute medical problems. The development of malnutrition in the elderly during acute hospitalization is a common event (22,23). Another group of nursing home admissions was composed of elderly living in the community that were dependent in their activities of daily living. The development of nutritional problems is common in this group (22,23).

Our study shows once again that the potential for development of active tuberculosis is high among nursing home populations. Aggressive screening with two-stage tuberculin test upon admission to the nursing home and annually, together with the use of prophylactic agents when indicated, should be a priority in this setting. The possibility of active tuberculosis should be considered in all nursing home residents with unexplained persistent respiratory symptoms, fever, weight loss and pneumonia that fails to improve with adequate therapy.

## Resumen

Se estudiaron 118 admisiones a una casa de salud para determinar la prevalencia de infección por *M. tuberculosis* y la prevalencia de factores de riesgo para el desarrollo de tuberculosis activa. La prevalencia de pruebas de tuberculina positivas a la admisión fue de 22.5%. Los factores de riesgo para el desarrollo de tuberculosis más prevalentes fueron diabetes mellitus (42.4%), pesar menos de 90% del peso ideal (41.5%) y abuso de alcohol (12.7%). Treinta y cuatro por ciento de las admisiones

tuvieron albuminas séricas por menores de 3.5 g/dl. No se encontró ninguna asociación entre la edad o el pobre estado nutricional y la prevalencia de pruebas de tuberculina positivas al momento de la admisión al utilizar el análisis de regresión logística. Estos resultados muestran una prevalencia de pruebas positivas al momento de la admisión a casa de salud (22.5%) sustancialmente menores que las encontradas previamente en residentes de la casa de salud (42.9%).

### Acknowledgement

We express our gratitude to Margarita Flores, RN, and Luz I. Rivera, RN, who were in charge of tuberculin testing and keeping the nursing home's PPD records

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