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The Incidence of Tuberculosis Among North Carolina Migrant Farmworkers

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ABSTRACT

Objectives. We studied the incidence of primary infection and active tuberculosis among a group of farmworkers for whom the prevalence had previously been established.

Methods. All locatable subjects from a previous random sample of farmworkers were tested with PPD, Mumps, and Candida antigen and completed verbal questionnaires. Subjects with positive PPD's provided sputum samples and received chest x-rays.

Results. 94 of 543 previous subjects were relocated. 48 were PPD positive on previous testing and were not further evaluated. Of the 46 who were PPD negative (confirmed with control antigens) three years earlier, 2 had developed active TB in the interim and 30% (14) were PPD positive. All had been engaged continuously in migrant farmwork. Lack of access to health was significantly associated with primary infection.

Conclusions. Active transmission of tuberculosis continues among migrant farmworkers at extremely high levels. Institutional features of migrant farmwork, such as lack of access to health care, contribute significantly to this problem.

INTRODUCTION

The resurgence of tuberculosis, probably only beginning, has resulted from the HIV epidemic, the erosion of the public health system, and worsening socioeconomic conditions among certain groups.(1) Thus, the rise in tuberculosis has been most dramatic among minorities, those with HIV infection, the homeless, prisoners, immigrants, and migrant farmworkers.(2-24) We recently reported the results of a study of tuberculosis among a random sample of migrant farmworkers, in which the prevalence of tuberculosis among African-American subjects was 3.6% -- exceeding the prevalence reported in any other population based sample of immunocompetent non-hospitalized individuals.(21) We report here the first longitudinal study of tuberculosis among migrant farmworkers.

METHODS

Subjects. Randomly selected subjects who participated in a 1988 study of tuberculosis were re-contacted by review of outreach records of migrant health centers, county health departments, and files of the North Carolina Employment Security Commission.

Skin Testing and Diagnosis. After obtaining informed testing with antigens, questionnaire administration, chest-radiography and sputum collection were accomplished as described elsewhere,(21) except that two control antigens, *Candida albicans* (10 units) and mumps (4 units) were employed.

Case Definition. A subject was defined as a TB case if one or more of the following criteria were met: 1) a sputum sample positive for *M. tuberculosis* was obtained; 2) radiographic findings were consistent with pulmonary tubercular disease; 3) the subject was currently under prescription of Isoniazid and rifampin or an additional drug.

Analysis. Data was analyzed by means of Chi-square and Fisher's Exact Tests, Student's T-tests, and logistic regression analysis.

RESULTS

Ninety-four former subjects, engaged in migrant work throughout the interim, were re-contacted in 15 different migrant labor camps in 3 counties. Forty-eight subjects had tested PPD positive previously and were not retested. Forty-six previously PPD negative subjects were retested. The demographics of these subjects (Table 1) were similar to the previous sample. Forty-two percent had indications of alcoholism on the basis of CAGE type questions.

Seventy-four percent reported two or less encounters with health providers in the three years since prior testing; 22% reported no encounters during this time. Sixty-one percent reported that they had been denied access to medical services during this time by their labor contractors.

More African-American subjects reported residence in a camp with a TB case (Table 1) than did Hispanics (p=.006, RR 13.2, 95% CI 1.5, 114). More African-American subjects had received another PPD during the inter-testing period than Hispanic subjects. (Table 1).

Of the 46 subjects who had been PPD negative on initial testing, 30.4% (14) were positive on retesting, including the 2 subjects who had developed active TB in the interim (Table 1). Fifty-six percent (26) had negative PPD tests confirmed by positive control antigen reactions. Thirteen percent (6) were unreactive to PPD and control antigens. Four of these six subjects had positive control reactions initially. The PPD conversion rate was 35% (n=12) among African-American subjects and 17% (n=2) among Hispanic subjects, not a significant difference (p=.461, Fisher's Exact Test, 2-tail). The annual incidence rate of primary infection was 12% among African-American subjects and 5.6% among Hispanic subjects.

A logistic regression model was tested with age, race, residence in a camp with a TB case, indication of alcoholism, and number of medical visits as independent variables and positive PPD as the dependent variable. Only number of medical visits was significant, with an inverse association with positive PPD (p=.04, linear regression). The mean number of visits to health centers by PPD positive subjects was 0.66 vs 2.09 by PPD negative subjects (p=.0002, Student's t-test).

Only a small number of children were tested (n=7); however, one subject, a seven year old African-American female, had a strongly positive PPD (17x19 mm) and was placed on preventive therapy. This subject had resided during the interim period in the same labor camp as one of the cases of TB.

Ten of the twelve PPD positive and 3/6 anergic subjects had negative sputum samples and chest films. Two subjects were diagnosed with active TB in the inter-testing period. Both were middle aged black males with more than 15 years in migrant farmwork. Thus, the incidence of active tuberculosis among African-American subjects was 5.9% for the three year period, with an annual incidence of active tubercular disease of 1.96%

DISCUSSION

Although limited by the small sample size, this is one of the few longitudinal studies of tuberculosis transmission in any high risk group. The small sample size results from two factors characteristic of farmwork -- transience and a high prevalence of tuberculosis. Nearly 100 subjects were re-contacted, but the majority had tested PPD positive previously.

As in the initial study, high rates of active disease and primary infection were demonstrated. The 12% annual incidence of primary infection demonstrated should result in an annual incidence of active disease of 1.2%, compared with the 1.96% we demonstrated. The incidence rate of active tuberculosis among African-American farmworkers reported here is nearly 200 times the national incidence.(1)

These findings indicate that access to health care is a significant risk factor for primary infection. Groups under a single employer would have a similar degree of access, and delay of treatment in individuals with active disease may increase transmission. In our previous study, 22% of subjects (n=287) reported no health care visits in three years, and 61% of all subjects reported that they had been denied access to medical services by their employers.(25)

North Carolina is the largest farmworker state without Worker's Compensation. Effective Worker's Compensation is a prerequisite to improving the health of farmworkers in general, but will also help to prevent transmission of tuberculosis. Since farmworkers with acute work related injuries are sometimes denied access to medical treatment by employers,(25) the chronic symptoms of tuberculosis are likely to be given a low priority by employers and even workers.

A committee appointed by the North Carolina state legislature to study Worker's Compensation recently voted to disband itself, despite ample evidence from other states demonstrating the economic feasibility of Worker's Compensation and the need for it in North Carolina.(25,26) When disregard for farmworkers' health is institutionalized, tuberculosis control without systemic reform is unlikely. We believe that these are issues which must be dealt with by the responsible public health agencies before tuberculosis control is achieved among migrant farmworkers. Failure to do so will not only allow the persistence of tuberculosis among these groups but further transmission among the general public.

It has been three years since the release of the Strategic Plan for the Elimination of Tuberculosis from the United States, and farmworkers have been recognized as a high risk group for at least that long. Although the proposed budget for tuberculosis control in 1993 is 325 million dollars, no funds have been designated for tuberculosis control among farmworkers in any state. In addition, the majority of farmworkers in North Carolina are Spanish speaking, yet only two of the 100 North Carolina County Health Departments employ Spanish translators, making screening and identification of high risk individuals difficult. Aside from individual efforts by local migrant health centers to increase screening (without additional resources), little has been accomplished to reduce the prevalence of tuberculosis among migrant farmworkers.

In order to help achieve the goals of the Strategic Plan for the Elimination of Tuberculosis from the United States, we make the following recommendations for TB control among farmworkers:

1) The appropriation of funds to migrant health centers for tuberculosis control. Migrant health centers have the knowledge and expertise to work most effectively with this population.

2) Development of standardized outreach TB screening programs in all migrant health centers, with shared computerized results.

3) Increased penalties for violations of migrant housing standards, especially those pertaining to crowding.

4) The Centers for Disease Control, the Department of Health and Human Services, and OSHA should support universal Worker's Compensation for migrant farmworkers in all states.

5) Use of Restriction Fragment Length Polymorphism analysis to identify possible epidemogenic foci among farmworkers to prioritize specific interventions.

6) The implementation in the migrant health setting of more efficient means of diagnosis and treatment of tuberculosis, including shortened direct observed therapy regimens and gene probe techniques.

REFERENCES

1. Centers for Disease Control. Tuberculosis morbidity in the United States: Final Data, 1990. MMWR 1992. 40;No. SS-3.

2. Rieder HL, Cauthen GM, Block AT, et al. Tuberculosis and acquired immuno-deficiency syndrome - Florida. Arch Intern Med 1989. 149:1268-1273.

3. CDC. Tuberculosis and human acquired immuno-deficiency virus infection: recommendations of the Advisory Committee for the Elimination of Tuberculosis (ACET). MMWR 1989. 38:235-239, 243-250.

4. Snider DE, Salinas L, Kelly GD. Tuberculosis: an increasing problem among minorities in the United States. Public Health Rep 1989. 104:646-653.

5. CDC. Tuberculosis among American Indians and Alaskan Natives: United States, 1985. MMWR, 1987;36:493-95.

6. CDC. Tuberculosis in blacks-United States. MMWR 1987;36:212-220

7. CDC. Tuberculosis transmission along the US-Mexican border -1990.

8. Sherman MN, Brickner PW, Schwartz MS, et al. Tuberculosis in single-room occupancy hotel residents: a persistent focus of disease. New York Medical Quarterly 1980:2:39-41.

9. CDC. Tuberculosis control among homeless populations. MMWR 1987;36: 257-260.

10. Barry MA, et al. Tuberculosis screening in Boston's homeless shelters. Public Health Rep, 1986;101:487-98.

11. CDC. Drug-resistant tuberculosis among the homeless--Boston. MMWR; 34:429-31.

12. McAdam JW, Brickner PW, Scharer LL, et al. The spectrum of tuberculosis in a New York City men's shelter clinic (1982-1988). Chest 1991;97:798-805.

13. Nolan CM, Elarth AM, Barr HA, et al. An outbreak of tuberculosis in a shelter for homeless men: a description of its evolution and control. Am Rev Respir Dis, 1991;143:257-61.

14. Prevention and control of tuberculosis in correctional institutions: recommendations of the Advisory Committee for the Elimination of Tuberculosis. MMWR, 1989;38(18):313-230, 1989.

15. Abeles, H et al. The large city prison: a reservoir of tuberculosis. Am Rev Resp Dis, 1970;101:706-09.

16. Stead, WW. Undetected tuberculosis in prison. JAMA, 1978; 240:2544-2547, 1978.

17. King L and G George. Tuberculosis transmission in a large urban jail. JAMA, 1977;237:791-92.

18. CDC. Tuberculosis among Hispanics in the Untied States, 1980. MMWR, 1982;(31):237-39.

19. Perez-Stable, EJ et al. Tuberculin reactivity in United States and foreign born Latinos: results of a community based screening program. AJPH, 1986;76(6):643-646.

20. Perez, GC et al. La tuberculosis en la zona norte del pais: predicciones epidemiologicas y estrategias operativas. Sal Pub Mex, 1981;XXIII(2):159-78.

21. Ciesielski SD, Seed JR, Esposito HD, Hunter N. The epidemiology of tuberculosis among North Carolina migrant farmworkers. JAMA 1991;265:1715-9.

22. Jacobson, MD, et al. Tuberculosis risk among migrant farm workers on the Delmarva Peninsula. AJPH, 1987;77:29-32.

23. CDC. Prevention and control of tuberculosis in migrant farmworkers: Recommendations of the Advisory Council for the Elimination of Tuberculosis. MMWR 1992;41:RR-10.

24. CDC. Tuberculosis among migrant farmworkers-Virginia (leads from the MMWR). JAMA, 1986;256(8:)977-981.

25. Ciesielski SD, Hall SP, Sweeney JD. Occupational Injuries among North Carolina migrant farmworkers. AJPH, 1991;81:926-927.

26. North Carolina Legislative Research Commission on Worker's Compensation for Farm Workers. Minutes of meetings held 11/21/92, 12/13/91, 1/31/92, 3/9/92, Legislative Building, Raleigh, NC.

HIV Infection, Syphilis, and Tuberculosis Screening Among Migrant Farm Workers — Florida, 1992

An estimated 2.7–4.0 million persons in the United States are classified as migrant and seasonal farm workers (*1*). Despite a high prevalence of tuberculosis (TB) and other conditions among migrant workers (*2–4*), approximately 13% have access to or receive care at federally funded migrant health clinics (*5*). During February–March 1992, to assess the prevalence of selected health conditions among migrant farm workers, the Florida Department of Health and Rehabilitative Services (FDHRS) conducted a voluntary screening for human immunodeficiency virus (HIV)-1 infection, syphilis, and TB among workers living in 14 migrant camps in Immokalee, Florida. This report summarizes the results of the screening and describes disease-prevention efforts developed by FDHRS for migrant workers.

The period February 1–March 31 was chosen for screening because Florida's perishable crops are in season and the number of migrant workers peaks. Outreach workers went door-to-door in the camps encouraging workers aged ≥16 years to enroll, and leaflets encouraging enrollment were posted in the camps several days before the screening began. Screening was conducted during evening hours. Participants received pretest HIV counseling and signed an informed consent form for testing for HIV-1 antibody (enzyme immunoassay with confirmatory Western blot or immunofluorescent assay), syphilis, and TB infection (Mantoux testing with 5 tuberculin units of purified protein derivative). In addition, participants completed an interviewer-administered questionnaire assessing their work, lifestyle, and medical history. Participants were asked to return within 48–72 hours for a skin test reading, serologic test results, and posttest HIV counseling.

Tuberculin skin tests (TSTs) were considered positive if the induration was ≥10 mm for HIV-1–seronegative persons and ≥5 mm for HIV-1–seropositive persons. Any positive skin test reading in this screening was attributed to infection with *Mycobacterium tuberculosis* because 1) bacille Calmette-Guérin (BCG) vaccination is usually given as a childhood vaccination in all native countries of migrant farm workers and TST reactivity to BCG wanes over time and 2) vaccinated persons included in this screening were in a group at high risk for TB.

Of an estimated 518 persons ≥16 years of age residing in the 14 migrant camps, 310 (60%) participated in the screening. Participants were predominantly male (247 [80%]), Hispanic (165 [53%]) or black non-Hispanic (130 [42%]), and foreign-born (Haiti [93 (30%)], Mexico [83 (27%)], and Guatemala [44 (14%)].

Twenty-six (8%) had reactive serologic tests for syphilis (STS); 15 (5%) were HIV-1–antibody seropositive (four of the 15 had reactive tests for both HIV-1 and syphilis). Persons born in the United States (11%) were more likely than those who were foreign-born (3%) to have positive HIV-1 tests (relative risk [RR]=3.6; 95% confidence interval [CI]=1.4–9.7) and reactive STS (RR=2.0; 95% CI=1.0–4.2). Of the 267 workers whose TSTs were read, 118 (44%) were positive, including four who were also HIV-1–antibody seropositive. TST positivity was similar among U.S.-born and foreign-born workers (RR=0.9; 95% CI=0.6–1.3).

Workers with reactive STS were referred for treatment; of the 26 who had a reactive STS, one person had primary syphilis; six, secondary syphilis; four, early latent syphi-

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lis; and five, late latent syphilis. Five had been previously treated for syphilis, and five were unavailable for examination.

Those with positive test results for TB or HIV-1 infection were referred for further evaluation. Thirteen of the 15 persons who were HIV-1 seropositive had newly diagnosed infections. Of the 118 participants with positive TSTs, 55 (47%) returned for chest radiographs and sputum collection. Isoniazid preventive therapy was initiated for 18 persons with latent tuberculous infection; in addition, active TB was diagnosed in one person and treatment was initiated. When necessary, ongoing care was arranged by referring workers to migrant health centers in other locations.

Analysis of questionnaire data (controlled for birthplace [i.e., U.S.-born versus foreign-born]) indicated that use of crack cocaine was associated with positive STS (RR=4.1; 95% CI=1.3–12.6). Risk factors associated with HIV-1–antibody seropositivity included having more than two sex partners during the last 6 months (RR=3.8; 95% CI=1.3–11.1), a prior history of syphilis (RR=3.8; 95% CI=1.2–11.7), and among men, having ever paid for sex (RR=2.8; CI=0.9–9.0). Injecting-drug use (IDU) and homosexual behavior were rarely reported, regardless of HIV-1–infection status; of those who were HIV-1 positive, none reported IDU, one male reported homosexual behavior, and one female reported bisexual behavior. Forty-seven percent of the participants had never used a condom.

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Editorial Note: When compared with migrant-worker populations in other areas of the United States, workers in the southeastern United States are more likely to live away from their families while doing farm work (64%), to live in poverty (73%), and to lack documentation of legal residence status (25%) (*6*)—factors that can impede their access to medical care. The findings in this report document high prevalences of syphilis, HIV-1 infection, and TB among migrant workers in this region of Florida. The 8% prevalence of positive STS among persons in this survey was higher than the 0.8% reported in a national serologic survey (*7*). Moreover, the HIV-1 seroprevalence of 5% was higher than the 3.5% reported in populations of Belle Glade, another Florida agricultural community, and the 2.6% reported for farm workers in North Carolina (*4,8*).

The high TST reactivity among workers in this survey is consistent with previous reports (*9*). Because test results were available within 72 hours, most workers in this screening returned to receive their test results; however, many workers relocated and did not return for follow-up with chest radiographs and sputum tests, which were scheduled several weeks later. In addition, some workers who tested positive but who did not have symptoms (e.g., coughing) did not believe a positive TST indicated TB. Workers were given letters with test results to present to health centers in other locations.

The FDHRS survey identified a substantial number of migrant farm workers with unrecognized and untreated preventable diseases. In particular, treatment and counseling of these persons could prevent transmission of STDs to their sex partners and,

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for TB, to those with whom they live and travel. Although the precise magnitude of TB among migrant workers is not known, different studies have detected high prevalences of asymptomatic tuberculous infection and clinical TB among these populations; the risk for TB among migrant workers has been estimated as six times greater than in the total U.S. population (*10*). The Advisory Council for the Elimination of Tuberculosis recently offered recommendations for the prevention and control of TB among migrant workers (*10*).

The screening to detect HIV-1 infection, syphilis, and TB among migrant workers in Immokalee underscores the need for public health professionals who are trained to respond to health-care needs within the migrant-worker population. The FDHRS used data from this screening to develop crosstraining for public health workers on STDs, including HIV infection, and TB and is conducting other assessments of the prevalence of communicable diseases among migrant farm workers in Florida.

References

1. Farmworkers Justice Fund. Farmworker demographics. In: The occupational health of migrant and seasonal farmworkers in the United States. Washington, DC: Farmworkers Justice Fund, 1986.
2. Ciesielski SD, Seed JR, Esposito DH, Hunter N. The epidemiology of tuberculosis among North Carolina migrant farm workers. JAMA 1991;265:1715–9.
3. Jones JL, Rion P, Hollis S, et al. HIV-related characteristics of migrant workers in rural South Carolina. South Med J 1991;84:1088–90.
4. Castro KG, Lieb S, Jaffe HW, et al. Transmission of HIV in Belle Glade, Florida: lessons for other communities in the United States. Science 1988;239:193–7.
5. de Anda T. Migrant farm workers' substance abuse: issues and concerns. Texas Journal of Rural Health 1992;31–8.
6. US Department of Labor. Findings from the national agricultural workers survey, 1990: a demographic and employment profile of perishable crop farm workers. Washington, DC: US Department of Labor, 1990;89:97–8.
7. Hahn RA, Magder LS, Aral SO, et al. Race and prevalence of syphilis seroreactivity in the United States population: a national sero-epidemiologic study. Am J Public Health 1989;79:467–70.
8. CDC. HIV seroprevalence in migrant and seasonal farmworkers—North Carolina, 1987. MMWR 1988;37:517–9.
9. CDC. Tuberculosis among migrant farm workers—Virginia. MMWR 1986;35:467–9.
10. CDC. Prevention and control of tuberculosis in migrant farm workers: recommendations of the Advisory Council for the Elimination of Tuberculosis. MMWR 1992;41(no. RR-10).

Current Trends

Imported Dengue — United States, 1991

Serum samples from 82 persons with suspected imported dengue (*1*) who had onset in 1991 were submitted to CDC from 27 states and the District of Columbia (Table 1, page 731). Of these, 25 (34%) cases (from 18 states) were serologically or virologically diagnosed as dengue. This report summarizes these cases.

The dengue serotype was identified by virus isolation in two of the cases. Travel histories were available for all persons with laboratory-diagnosed dengue (Table 1, page 731); 11 cases were acquired in Asia, seven in the Caribbean islands, four in

(continued on page 731)