Briefs

Prevalence and Risk Factors of Drug-Resistant Tuberculosis Along the Mexico–Texas Border

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A B S T R A C T

Objectives. This study determined factors associated with drug resistance among 3496 patients with tuberculosis who resided in Texas counties along the Mexican border.

Methods. Univariate and logistic regression analyses were performed to identify risk factors associated with drug resistance.

Results. Among patients with a history of previous tuberculosis, being 19 years or younger was the only factor associated with multiple drug resistance. Female sex, being 20 to 39 years of age, and foreign birth were risk factors for resistance among patients with no history of previous tuberculosis.

Conclusions. Factors contributing to drug resistance among Hispanic tuberculosis patients along the Texas–Mexico border may differ from those among other populations in the United States. (*Am J Public Health*. 2000;90: 271–273)

We recently reported a 70% higher rate of isoniazid resistance and a 100% higher rate of rifampin resistance among patients with tuberculosis living along the Mexico–Texas border than among nonborder patients.[1] Similarly, higher isoniazid resistance rates are seen in Mexican cities bordering the United States than in Mexico as a whole.[2–4] In this report, we describe the occurrence of drug-resistant tuberculosis in the 14 Texas border counties, measure trends, and identify demographic characteristics associated with both acquired and primary drug resistance.

Methods

We studied data from tuberculosis cases reported to the Tuberculosis Elimination Division of the Texas Department of Health from January 1, 1988, through December 31, 1997. Comparisons of groups with and without drug resistance and tests for trends were performed with the Epi Info software program (Centers for Disease Control and Prevention, Atlanta, Ga). We used logistic regression analyses to identify the independent risk factors associated with drug resistance. Odds ratios and 95% confidence intervals were calculated with Statistix (Analytic Software, Tallahassee, Fla). Models were calculated for 3 risks: isoniazid resistance, rifampin resistance, and multiple drug resistance. Risk factors found to be statistically significant ($P \leq .05$) in univariate analysis were included in the regression models for each resistance category; these included age (<20 years, 20–39 years, 40–59 years, ≥60 years), sex, birth outside the United States, and history of previous tuberculosis. Regression analysis was limited to Hispanics because 93% of the patients with tuberculosis were Hispanic, and it was conducted separately for those with and without a history of previous tuberculosis.

Results

Demographics

From 1988 through 1997, 22 295 tuberculosis cases were reported in Texas; 3496 of the patients (16%) resided in the 14 counties that border Mexico. In 1997, the incidence rate for the 14 counties was 15.3 tuberculosis cases per 100 000 population. Over 93% of the patients were Hispanic; half were born outside the United States, and of these 93% were born in Mexico.

Drug Resistance

Overall, 7.0% of patients were infected with *Mycobacterium tuberculosis* resistant to isoniazid and 4.1% were infected with strains resistant to rifampin (Table 1). Resistance to both isoniazid and rifampin (multiple drug resistance) was found in fewer than 3% of the patients. Patients with a history of previous tuberculosis had higher prevalences of drug resistance than patients without a history of previous tuberculosis. There were no discernible secular trends for the prevalences of isoniazid resistance or multiple drug resistance. However, there was a decreasing trend in the annual prevalence of rifampin resistance (test for trend $P = .01$).

Twenty-five patients were infected with *M tuberculosis* resistant to rifampin alone, and of these only 2 had a history of prior therapy; 3 were coinfected with HIV.

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Mexico was the country of birth for 90% of the 25 patients with resistance to rifampin alone.

Risk Factors

In univariate analysis, factors associated with drug resistance included male sex, being 20 to 59 years of age, foreign birth, and history of previous tuberculosis. Histories of diabetes, incarceration, drug abuse, homelessness, and HIV were not associated with drug resistance. Table 2 presents logistic regression results for isoniazid resistance and rifampin resistance grouped by history of previous tuberculosis. Among the 104 patients with a history of previous tuberculosis, patients younger than 19 years were far more likely than older patients to have resistance to isoniazid or rifampin. Being 19 years or younger was the only factor associated with multiple drug resistance (odds ratio [OR] = 14.41; 95% confidence interval [CI] = 1.38, 149.96).

Among patients with no history of previous tuberculosis, the sex and age patterns for risk of resistance differed from those observed among patients with a history of previous tuberculosis. Females were more likely than males to have drug resistance, and risk of resistance was highest among patients aged 20 to 39 years. Foreign-born patients were twice as likely as US-born patients to have resistance to rifampin. Risk factors for multiple drug resistance were being 20 to 39 years of age (OR = 1.94, 95% CI = 1.01, 3.75) and foreign birth (OR = 1.88, 95% CI = 1.07, 3.31). Males were less likely than females to have multiple drug resistance (OR = 0.57, 95% CI = 0.33, 0.96).

TABLE 1—Prevalence (Percentage) of Drug Resistance Among Patients With Tuberculosis in Texas Counties Bordering Mexico

Antibiotic	History of Previous Tuberculosis	No History of Previous Tuberculosis	Total
Isoniazid	14.4	6.7	7.0
Rifampin	9.9	3.8	4.1
Ethambutol	2.7	1.6	1.6
Multiple drug[a]	8.1	2.4	2.6

[a]Resistance to isoniazid and rifampin.

Discussion

Texas residents in the Mexico–Texas border counties are at significantly higher risk for tuberculosis drug resistance.[1] Transmission of drug-resistant strains present in Mexico may contribute to this higher risk. The percentage of tuberculosis cases in Mexico with isoniazid resistance is estimated to be 18%; for rifampin resistance, the estimate is 8%.[2] Much higher isoniazid resistance rates (29% to 56%) have been reported in Mexican cities bordering the United States.[3,4] The high prevalence of drug resistance in Mexico may be influencing disease trends in Texas. While a decreasing trend for isoniazid resistance and multiple drug resistance has been reported in the United States, no decreasing trend for isoniazid resistance or multiple drug resistance was observed in the Texas population bordering Mexico.[5]

Although a history of previous tuberculosis was a predictor of drug resistance in this study, only a small percentage of border patients with isoniazid resistance (9%) and rifampin resistance (10%) had a history of previous tuberculosis. In the United States, 11% and 16% of patients with isoniazid resistance and rifampin resistance, respectively, have histories of previous tuberculosis.[5] These percentages differ dramatically from those in New York City, where over 75% of patients with isoniazid resistance or rifampin resistance have a history of previous tuberculosis.[6] These comparisons suggest that as a component of drug resistance, history of previous tuberculosis is not as important on the border and that Hispanics in border counties are more likely to be initially infected with drug-resistant strains.

The rifampin resistance pattern in this border population is notable. The only decreasing drug resistance trend observed in this population was in rifampin-resistant tuberculosis. Nationally, 92% of tuberculosis patients with rifampin monoresistance are infected with HIV.[5] Along the Texas border, only 12% of tuberculosis patients with rifampin monoresistance are coinfected with HIV. In the United States, foreign-born and US-born patients have similar rates of rifampin resistance.[6] Along the border, patients born outside the United States with no history of previous tuberculosis have twice the risk for rifampin resistance of patients born in the United States. Factors different from those seen in other pop-

TABLE 2—Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Isoniazid Resistance and Rifampin Resistance Among Hispanics in the Mexico–Texas Border Counties, 1988–1997

	Patients With History of Previous Tuberculosis				Patients With No History of Previous Tuberculosis			
	Isoniazid Resistance		Rifampin Resistance		Isoniazid Resistance		Rifampin Resistance	
Characteristic	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex								
Male	1.18	0.36, 3.86	1.56	0.35, 6.89	0.71	0.51, 0.99	0.69	0.45, 1.05
Female[a]	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Age, y								
0–19	5.57	0.65, 48.55	16.74	1.51, 185.72	1.59	0.80, 3.14	1.71	0.78, 3.75
20–39	0.48	0.11, 2.10	0.76	0.11, 5.05	2.75	1.80, 4.21	1.76	1.04, 2.97
40–59	0.72	0.18, 2.87	1.76	0.34, 9.01	1.40	0.95, 2.47	1.25	0.70, 2.22
≥60[a]	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Foreign birth	1.65	0.51, 5.30	2.18	0.50, 9.48	1.38	0.98, 1.94	2.03	1.29, 3.18

[a]Reference group.

ulations must be contributing to rifampin resistance among Hispanic border patients with tuberculosis; these factors may include the misuse of rifaprim (rifampin and trimethoprim), a drug used to treat urinary tract infections, in treating tuberculosis patients.[3]

The prevalence of drug resistance varies across the United States. Factors contributing to drug resistance also vary. More knowledge of the specific factors contributing to drug resistance along the border will help local health authorities control the development and transmission of drug-resistant tuberculosis. □

Contributors

J. P. Taylor and L. Suarez both contributed to the conception and design of the study and were involved in the analysis and interpretation of the study data. Both authors wrote the brief and approved the final version, and both will take public responsibility for the content of the paper.

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