

Tuberculosis Control Policies in Transition

HANS H. NEUMANN, M.D.

IN EXPLORING the need for changes in public health methods of preventing tuberculosis, the characteristics of new cases reported in 1 year in New Haven, Conn., were analyzed.

New Haven is a city of more than 135,000 inhabitants with an average distribution, for U.S. cities, of middle class neighborhoods and poor sections. The incidence of new cases of tuberculosis in the city area is within the range of statistical expectations for urban Connecticut. New Haven's limited size makes followup of cases of public health concern quite manageable.

Morbidity and Mortality

The number of tuberculosis cases reported in New Haven declined from 151 in 1950 to 95 in 1960 and to 38 in 1970. Of the 38 cases reported in 1970, three were reactivations of the disease in known patients. Of the remaining 35 cases, 15 were re-

Dr. Neumann is director of preventive medicine, City of New Haven Department of Health. Tearsheet requests to Hans H. Neumann, M.D., City of New Haven Department of Health, 1 State Street, New Haven, Conn. 06511.

ported as minimal inactive (without symptoms and bacteriologically negative).

Of the 20 active new cases, two were extrapulmonary. One patient among the remaining infectious 18 patients was a recent immigrant, and at least five were known to be chronic alcoholics. All were unlikely to come to early medical attention through surveys.

Only one of the 20 patients with an active new case was under the age of 20; seven ranged in age from 20 to 39, eight were 40 to 59 years old, and four were 60 or over.

There were no "clusters" of active infections, and in only three new cases could a possible source be located. In 12 cases, 79 close contacts of patients were skin tested and examined; 70 were negative, nine were positive reactors, and none was found to have clinical illness.

Reporting of tuberculosis is generally accurate, and if the numbers of newly registered cases appear to be small, there is confirming evidence for the low incidence both in the absence of newly detected cases in mass surveys and in the low mortality rates.

Mortality paralleled the steady

downward trend in morbidity, with the rate per 100,000 declining from 198 in 1900 to virtually zero in 1969 and 1970. In 1970 two deaths were related to tuberculosis but were not caused by tuberculosis. A 70-year-old man died of bronchial carcinoma with metastases; autopsy revealed that active tuberculosis also had been present. The second death was caused by acute reaction to anti-tuberculosis drugs.

Control Policies

Until recently, public health methods commonly included mass screening with mobile X-ray units, mass screening in walk-in clinics, and mass tuberculin testing of school children. Control policies also included investigation of contacts, sometimes the periodic recall of patients who had recovered from the disease, and the preventive treatment of tuberculin reactors.

Mass screening by chest X-ray. In 1968, the last year in which the mobile unit was used in New Haven, more than 21,000 chest X-rays were taken in the greater New Haven area, yet no previously unknown case of tuberculosis was discovered by this means. In 1970 none of the 38 reported new cases was found

through X-ray screening, although more than 6,000 chest X-rays were taken in a walk-in clinic. Most of the active cases were discovered when the patients became symptomatic and visited physicians or hospital clinics.

Promoting periodic chest X-rays for unselected populations has been discontinued. The problem remains of how best to accelerate the decline of tuberculosis at a time of shifting priorities in public health.

Mass tuberculin testing of school children. In a 1969 screening program in Connecticut schools, a reactor rate of less than 2 percent was found; almost all the reactors were X-rayed, and no new case of tuberculosis was revealed. In 1970 in New Haven, the only new active case in a person under the age of 20 was reported to be in an infant.

It is realized that mass tuberculin testing programs in the schools for casefinding purposes have become uneconomical and unproductive. Their effectiveness is further decreased in city schools by logistic difficulties in obtaining parental permission and by frequent absences at testings or readings; also by false negative findings after using a jet injector (1) and false positive findings after multiple puncture tests, requiring retesting (2).

Tuberculin testing of selected groups in schools can be valuable on a limited basis for indexing trends, which may help in determining changes in program emphasis. Sporadic outbreaks of tuberculosis still may occur, and this possibility requires watchfulness. Even annual skin testing of school children in all grades could not prevent such an occurrence.

Periodic recall. In 1970 only

three patients in New Haven with treated tuberculosis had relapses; all three cases were controlled within short periods by treatment of the patients. Thus an elaborate system of followup for all past cases results in poor cost efficiency. Recall letters for periodic examinations remain feasible and reasonably economical, though of doubtful effectiveness (3).

Chemoprophylaxis. Control policies for patients with positive skin tests have been controversial; some recommendations favor the preventive treatment of all (4) or all young reactors to Mantoux tests (5). Our data do not justify such a procedure as a preventive method.

The preventive treatment of tuberculosis is usually promoted (a) as a public health measure to speed up the eradication of tuberculosis (6) or (b) to prevent active disease from developing in a person.

Little is accomplished toward eradication if only a small percentage of the reactors in a city can be reached for treatment or if those in whom active disease is most likely to develop, such as alcoholics, are least likely to take part effectively in preventive programs.

It seems unrealistic to try to eradicate a sporadic disease by subjecting reactors, found casually on a hit or miss basis, to a year or 18 months of daily treatment. The appearance of drug resistant mycobacterial strains following inadequate, haphazard treatment has been reported from many parts of the world (7), and one may speculate that the irregularity of treatment courses in poorly motivated "well" patients might contribute to this problem.

Another public health problem lies in the fact that in New

Haven the number of reported cases of hepatitis exceeds that of tuberculosis, and there is undoubtedly an additional large number of subclinical and unreported cases. Information is lacking about the hepatotoxic effects of isoniazid in the presence of coincidental acute viral hepatitis. The probability of this coincidence is not remote and cannot be ignored, in the calculation of comparative risks, in establishing indications for chemoprophylaxis.

If the purpose of chemoprophylaxis is prevention of disease in the person, the probability of activation in a given year should be a reasonably great one—probably at least one in a hundred. This is rarely true of mere reactors in the light of the estimates of annual risks for various age groups in New Haven. A proportion of active infections occurs in previous nonreactors, but even assuming that all activations are progressions of the disease in reactors, the estimated annual risk of activations in some groups is remote, as shown in the table.

The annual risk of activation appears to be minimal for the positive skin reactors among whites in New Haven. A long average life expectancy would be required to increase to even 1 percent the probability of ultimately developing active disease. A 5 to 10 percent probability of activation in reactors, reported in the literature (9), is not borne out by our statistics. The male nonwhite alcoholic is indeed in a high-risk group, but to average his risk into the population at large would be grossly misleading.

As age advances, the risk of activation declines: with 6,800 estimated reactors, 13 new active cases were found in patients

Annual risk of tuberculosis activation in reactors, New Haven, Conn., 1970

Sex	Race	Age group (years)	Population rounded to nearest 1,000	Estimated percent of reactors ¹	Estimated number of reactors (rounded)	Number of new active cases reported	Relation of number of cases to number of reactors	Annual risk, ratio in 1970
Both	Combined	0-19	44,000	1.5	660	7	(²)	.....
Both	Combined	20-39	38,000	10.0	3,800	7	7: 3,800	1: 550
Both	Combined	40-59	29,000	30.0	8,700	8	8: 8,700	1:1,100
Both	Combined	60 and over	24,000	50.0	12,000	4	4:12,000	1:3,000
Both	Combined	All	135,000	.....	25,000+	20	20:25,000	1:1,250
Male	Combined	All	65,000	.....	12,000	16	16:12,000	1: 750
Female	Combined	All	70,000	.....	13,000	4	4:13,000	1:3,250
Both	White	All	101,000	.....	21,000	5	5:21,000	1:4,200
Both	Nonwhite	All	34,000	.....	4,000	15	15: 4,000	1: 270
Male	White	All	49,000	.....	10,000	5	5:10,000	1:2,000
Female	White	All	52,000	.....	11,000	0	0	0
Male	Nonwhite	All	16,000	.....	1,900	11	11: 1,900	³ 1: 175
Female	Nonwhite	All	18,000	.....	2,100	4	4: 2,100	1: 525
Both	Nonwhite	0-19	17,000	.....	250	.....	(²)	.....
Both	Nonwhite	20-39	10,000	.....	1,000	8	8: 1,000	³ 1: 125
Both	Nonwhite	40-59	5,000	.....	1,500	5	5: 1,500	1: 300
Both	Nonwhite	60 and over	2,000	.....	1,000	2	2: 1,000	1: 500

¹ Estimates based on surveys in schools, on school personnel, and on findings in multiphasic screenings (reference 8).

² The only active case reported was in an infant and therefore in a "recent converter" rather than progression

in a reactor.

³ At least 4 of the 11 male nonwhites with reported active disease were chronic alcoholics, which greatly reduced the risk of activation in the nonalcoholic males of this group.

under the age of 45. Among those over 45, with a calculated number of more than 18,000 reactors, there correspondingly should have been 35 cases. There were only seven.

The rule that all reactors or at least all recent converters below the age of 20 should be treated for a minimum of 1 year is unworkable and unrealistic within a population of more than 44,000 in this age group. Contacts of persons with known cases were treated, but considering that many hundreds of reactors and converters in this age group remained undiscovered and untreated, one may wonder how great a risk is really involved since not a single case has progressed into overt disease, no patient has been hospitalized, and no deaths from tuberculosis have occurred in the age group 0 to 19 in the past 14 years.

The use of routine chemoprophylaxis, or "epi-treatment," in tuberculosis may involve more hazards than benefits if, as a pre-

ventive measure, it aims too generously at low-risk groups. Caution is particularly indicated, given an increasing general awareness of adverse reactions, to any prolonged use of medication—even if the risk of toxicity is low.

Chemoprophylaxis will continue to serve its purpose under selected circumstances, but it appears to be unjustifiable to include reactors in general as targets for it unless there are major known factors potentiating the risk of disease progression. For many persons with borderline cases a clinical followup, without medication, may require no more observation than the close supervision needed for those given preventive treatment.

Status of Reactors

For mere reactors there is as little need for registration or recall for periodic examinations as there is for preventive treatment. Only a small proportion of the estimated 25,000 reactors in New

Haven could, at best, become known and so be registered. At this stage there is no reason to label and pursue, for debatable public health reasons, such a randomly collected population segment.

Conclusion

Tuberculosis cases in the United States have decreased steadily during this century. Selection of the right tools to spur this trend is becoming more difficult; methods tend to become uneconomical and ineffective as cases become sporadic.

Mass surveys by means of chest X-rays have become ineffectual; mass tuberculin casefinding surveys in urban schools are no longer productive enough to be justified, considering their cost, organizational difficulties, and competing health needs.

Great variations of risk in different population groups limit the indications for preventive treatment. These unresolved problems

also remain: the emergence of resistant mycobacterial strains, hastened by poor cooperation on the part of the unmotivated; and the potential of side effects, balanced against a low risk of active disease developing in a person. Chemoprophylaxis seems unsuitable at this time for broad application as a public health measure.

Despite the low yield of cases, prevention efforts in urban areas should continue to be directed primarily at the close contacts of active cases, at school personnel, and at such high-risk groups as prison inmates, patients admitted to hospitals, alcoholics, and those who are symptomatic. In schools and in health education of the public, attention should be focused on the symptomatic, particularly on persons with coughs, with appeals to them to be skin tested or to have chest X-rays.

The decline in the incidence of tuberculosis is gratifying, yet complacency is not justified be-

cause of the mobility of urban populations, the high prevalence of this disease in many other countries, and the neglect of health needs in some youth segments.

The eradication of tuberculosis apparently can be achieved in the more isolated and rural sections of the country with relatively stable populations. Yet, in attempting to spur the decline of tuberculosis elsewhere, there is a need to guard against methods that are unproductive, uneconomical, or unjustifiable.

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In New Haven, Conn., a city of 135,000, the number of new tuberculosis cases declined from 151 in 1950 to 95 in 1960 and to 38 in 1970. Casefinding by mass surveys with chest films and with skin testing in schools has become ineffective and uneconomical. Since tuberculosis has been reduced to a sporadic disease, the selection of public health methods to spur the downward trend is becoming difficult.

The calculated risk of activation in reactors, including those under 20 years old, seems too small to favor chemoprophylaxis (with its own risk factor) as a method of prevention, except for close contacts of active cases and selected patients with lung and other pathological conditions.

With a population of 44,000 under the age of 20 in the city, yearly skin testing to find converters is not feasible. Hundreds of converters and reactors remain undiscovered, yet no case of active tuberculosis developed in this age group in 1970, and no patient was hospitalized; also, no deaths have occurred from tuberculosis in patients under 20 in the past 14 years.

While sporadic cases of active tuberculosis continue to appear, statistical data in New Haven indicate that, in most population groups, the risk of activation in tuberculin reactors is too remote to single this group out for treatment, registration, or followup.