NOTES ON TUBERCULOSIS CONTROL IN NICARAGUA[1]

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The initiation of a tuberculosis campaign in Nicaragua has resulted in the collection of valuable epidemiological information and the adoption of a series of control measures. Tuberculosis control activities have become part of the routine activities of health centers.

The information available on tuberculosis in Nicaragua showed that the damage it was doing and the lack of control services made the disease worthy of special attention from the health authorities.

The Ministry of Public Health therefore decided to launch a campaign to promote effective use of the knowledge and methods considered nowadays to be most effective.

Measures Adopted

Of the activities decided upon for this purpose, the most important were the following:

- To enter into an agreement with PASB/WHO and UNICEF to launch a tuberculosis control program in the country.
- To establish and put into operation a national agency equipped to set standards and coordinate actions.
- To teach the staff of local health services (nurses and nursing auxiliaries) such simple procedures as tuberculin testing and intradermal BCG vaccination, and to make these part of the routine activities of the local health services.
- To fit out and put into operation a mobile unit, to work in coordination with the permanent health units.
- To provide guidance to health service physicians on tuberculosis control methods and techniques.

These decisions have resulted in the gathering of valuable epidemiological information and in the carrying out of preliminary control measures.

Immediate Results

During the second half of 1964, with the help of the recently established mobile unit of the Tuberculosis Division, the health centers—which up to then had not undertaken any tuberculosis control activities—gave tuberculin tests to 134,265 persons, vaccinated 99,063 with BCG, and began the treatment of patients and the chemoprophylaxis of contacts. The population of the country was 1,569,716. The tuberculin test used was the WHO standard test except that the dose used was 2 TU in 0.1 ml, which is equivalent to 0.04 mg purified tuberculin RT 23 with Tween 80. Since the main purposes were to vaccinate negative persons with BCG, to X-ray positive reactors, and to detect and treat cases, no attention was paid to selecting a representative sample.

Of the 134,265 persons who were tuberculin-tested (8.6 per cent of the population), 29,241 lived in Managua, the capital of the country (8.9 per cent of the city's population), and 105,024 in urban and rural areas in the other departments (8.4 per cent of the population of those departments). Most of the persons examined (74.8 per cent) were 19 years of age or less. They constituted 11.9 per cent of the total population in this age group.

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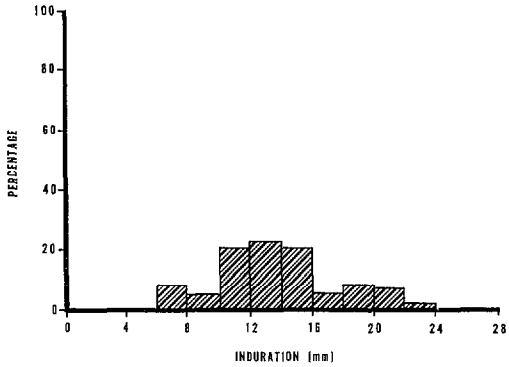
FIGURE 1 — Distribution of Tuberculin Sensitivity in Nicaragua, 1964.



Extent of the Infection

Present knowledge indicates that tuberculosis prevalence in a population depends primarily on the spread of the bacillus. As is well known, an infected person may develop the disease whenever his defenses fail him, and he then becomes a potential focus of infection. For these reasons, prevalence of infection is considered a useful epidemiological index.

The percentage of tuberculin-positive persons (induration of 6 mm or more in diameter) in the population examined was 23.7. The percentage increased with age: it was 15.3 in the group from 0 to 19 years and 48.6 in those 20 years and over. It was lower in females: 49 for women between 40 and 49, but more than 62 for men in that age group (Tables 1 and 2, Figure 2). Among the population examined in Managua, 30.8 per

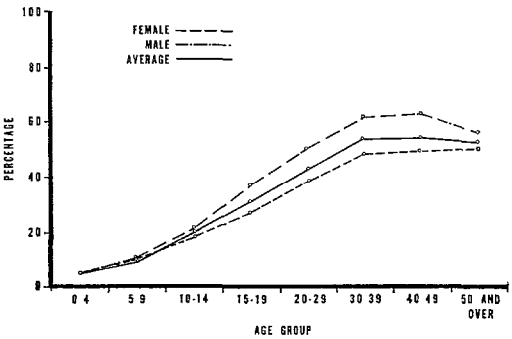
TABLE 1 — Number of Tuberculin-Positive Reactors (Induration of 6 mm or More), by Age and Sex, among 134,265 Persons Examined, Nicaragua, 1964.

Age group (years)	Females examined	Positive reactors		Males examined	Positive reactors		Total		
							Persons examined	Positive	
		No.	%		No.	%		No.	%
0–4	9,712	491	5.1	9,655	516	5.3	19,367	1,007	5.2
5–9	17,726	1,819	10.3	16,259	1,661	10.2	33,985	3,480	10.2
10–14	18,167	3,401	18.7	15,410	3,226	20.9	33,577	6,627	19.7
15–19	7,848	2,131	27.2	5,690	2,087	36.7	13,538	4,218	31.2
20–29	8,335	3,164	38.0	5,729	2,840	49.6	14,064	6,004	42.7
30–39	5,389	2,587	48.0	3,380	2,074	61.4	8,769	4,661	53.2
40–49	3,279	1,607	49.0	1,935	1,202	62.1	5,214	2,809	53.9
50 and over	3,645	1,807	49.6	2,106	1,149	54.6	5,751	2,956	51.4
Total....	74,101	17,007	22.9	60,164	14,755	24.5	134,265	31,762	23.7

TABLE 2 — Number of Positive Reactors (Induration of 6 mm or More), by Age Group, among 134,265 Persons Examined, Nicaragua, 1964.

Age group (years)	Total population (census)	Population examined		Positive reactors	
		No.	%	No.	%
0–19	843,408	100,467	11.9	15,332	15.3
20 and over	726,308	33,798	4.7	16,430	48.6
Total.....	1,569,716	134,265	8.6	31,762	23.7

FIGURE 2 — Number of Tuberculin-Positive Reactors (Induration of 6 mm or More), by Age and Sex, Nicaragua, 1964.



cent reacted positively. The figure was 22.4 in the group from 0 to 19 years and 58.6 in those 20 years and over (Table 3). In the other departments the over-all percentage was 23.1—14.6 in the group from 0 to 19 years and 47.9 in those 20 years and over (Table 4). From these data it may be estimated that the country has 129,049 positive reactors in the 0-to-19 age group and 352,986 in the group 20 years and over (Table 5).

Although radiological evidence does not necessarily prove tuberculosis, a positive reaction to tuberculin coupled with radiological evidence of pulmonary lesions is a good indication. In the course of the program, the mobile unit made 70 mm miniature X-rays of 4,093 positive reactors to tuberculin; the suspected cases were given a radiography; and the existence of pulmonary or pleural pathology was confirmed in 75 (1.84 per cent). These positive reactors were regarded as active cases of tuberculosis and were given treatment.

The prevalence of the disease increased with age, ranging from 1.3 per cent among persons between 0 and 19 years to 2.4 per cent among those 20 years old and over (Table 6).

TABLE 3 — Number of Positive Reactors (Induration of 6 mm or More), by Age Group, among 29,241 Persons Examined in Managua, Nicaragua, 1964.

Age group (years)	Population of Managua (census)	Population examined		Positive reactors	
		No.	%	No.	%
0–19	167,164	22,486	13.5	5,036	22.4
20 and over	160,802	6,755	4.2	3,961	58.6
Total.....	327,966	29,241	8.9	8,997	30.8

TABLE 4 — Number of Positive Reactors (Induration of 6 mm or More), in Departments of Nicaragua (except Managua), 1964.

Age group (years)	Population of departments (census)	Population examined		Positive reactors	
		No.	%	No.	%
0–19	676,244	77,981	11.5	11,366	14.6
20 and over	565,506	27,043	4.7	12,946	47.9
Total	1,241,750	105,024	8.4	24,312	23.1

TABLE 5 — Estimated Prevalence of Tuberculosis among Positive Reactors, in the Age Groups 0-19 Years, and 20 Years and Over, Nicaragua, 1964.

Age group (years)	Total population (census)	Positive reactors		Cases	
		No.	%	No.	%
0–19	843,408	129,049	15.3	1,678	1.3
20 and over	726,308	352,986	48.6	8,472	2.4
Total.....	1,569,716	482,035	30.7	10,150	2.0

TABLE 6 — Number of Radiologically Confirmed Cases of Tuberculosis among Positive Reactors, Nicaragua, 1964.

Age group (years)	Total population (census)	Population tuberculin-tested		Positive reactors		Positive reactors X-rayed		Cases	
		No.	%	No.	%	No.	%	No.	%
0–19	843,408	100,467	11.9	15,332	15.3	1,974	12.9	25	1.3
20 and over	726,308	33,798	4.7	16,430	48.6	2,119	12.9	50	2.4
Total.....	1,569,716	134,265	8.6	31,762	23.7	4,093	12.9	75	1.8

The frequency distribution of these cases by size of tuberculin reaction shows a prevalence of 0.9 per cent among persons in whom the induration measured 6 to 9 mm in diameter and 2.2 per cent among those in whom it measured 10 mm or more.

There appears to be some relationship between the prevalence of tuberculosis, the diameter of the reaction, and the age. Thus in the group 0 to 19 years of age the prevalence was 0.5 per cent among those with reactions of 6 to 9 mm and 1.6 per cent among those with reactions of 10 mm or more, whereas in the group 20 years of age and over the prevalence was 1.3 per cent among those with reactions of 6 to 9 mm and 2.8 per cent among those with reactions of 10 mm and more.

Among persons under 50 years of age (Table 7), the highest case frequency was found in those with reactions measuring 10 to 15 mm in diameter.

Assuming that the data obtained are representative, it may be estimated for the general population that among the positive reactors in the age group 0 to 19 years there were about 1,678 cases of tuberculosis (1.3 per cent) and in the age group 20 years and above about 8,472 (2.4 per cent), as may be seen from Table 5.

Even though these results do not issue from a planned study of a representative sample of the population, they may—as the first epidemiological data obtained in the country—be of some use in considering future action in each area.

Measures to be Adopted

These preliminary operations show the following measures to be advisable:

1. Reorganize the Tuberculosis Division and staff it with the personnel needed for supervising and evaluating the work under way and orienting, coordinating, and supervising future activities.

TABLE 7 — Distribution of Radiologically Confirmed* Cases of Tuberculosis, by Age and Size of Induration, Nicaragua, 1964.

Age group (years)	Size of induration (mm)	Persons examined	Cases	
			No.	%
0–19	6–9	557	3	0.5
	10–15	1,104	18	1.6
	16 and over	313	4	1.3
20–29	6–9	175	2	1.1
	10–15	421	9	2.1
	16 and over	146	3	2.1
30–39	6–9	146	2	1.4
	10–15	337	11	3.3
	16 and over	91	1	1.1
40–49	6–9	102	1	1.0
	10–15	210	6	2.9
	16 and over	72	1	1.4
50 and over	6–9	133	2	1.5
	10–15	224	8	3.6
	16 and over	62	4	6.5
Total.....	6–9	1,113	10	0.9
	10–15	2,296	52	2.3
	16 and over	684	13	1.9

* 14"x16" X-rays indicating pulmonary or pleural pathology.

2. Continue training technical and auxiliary health-center personnel for as long as necessary.
3. Make tuberculosis control a routine activity of the general health centers.
4. Operate the mobile unit as an extension of the health centers, to broaden and increase the effectiveness of their activities.

Bacteriological Examination

The stress laid on radiological diagnosis has in many instances relegated laboratory diagnosis to a secondary role. However, a high percentage of the shadows found on X-ray examination require no treatment, either because they are not caused by tuberculosis or because the lesions are inactive and not dangerous. Frequently, drugs and resources are wasted in treating persons who are not tuberculous.

Sputum examination, which is easy and cheap, is just as important as radiography; it does not detect all the cases, but it does catch most of those that need immediate treatment and thus prevents them from becoming a source of contagion in the community.

From all this it follows that whenever a chest X-ray is made, even by mobile units, a sputum examination should also be made.

The existing public health laboratories should be used for bacteriological examinations and for supervising treatment, even if only symptomatic cases are covered to start with. In this way a good number of contagious cases will be detected and treated.

Radiological Examination

Chest X-rays are expensive, and the procedure should therefore be limited to groups in which a considerable number of cases is expected to be found.

In most countries it is practically impossible, for financial reasons, to devote to tuberculosis alone as many X-ray units as are required. All the community's radiological resources should therefore be called into play; even if there are not very many of them, there will be enough for the cases that are most important epidemiologically. A sensible measure would be to use the X-ray apparatus of general hospitals—initially for the radiological supervision of cases and contacts discovered by the health centers through bacteriological examinations, and subsequently for small groups of positive reactors to tuberculin.

Treatment and Control

Case-detection measures will be of no avail if there are no facilities for the proper treatment of patients and the supervision of contacts.

Chemotherapy for the largest possible number of cases should have high priority among tuberculosis control activities, this being the best curative measure available

at present. But it must be used in such a way as to stop the discharge of bacilli in the sputum as quickly as possible (in four months, on the average) and to prevent the appearance of resistant strains. Improvement should show up in the clinical and radiological examinations.

The effectiveness of a program should of course be measured by the number of patients who successfully complete the minimum recommended treatment, not by the number of cases discovered and recorded.

To obtain the best results from chemotherapy, it is recommended that efforts be concentrated on the following:

- Treatment of persons found on bacteriological examination to be discharging bacilli, and, in the absence of bacteriological findings, of those who are tuberculin-positive and whose X-rays reveal shadows indicative of a cavity or a gangliopulmonary lesion. If the extent or appearance of the lesion, together with clinical and epidemiological findings, suggest that a person is suffering from tuberculosis but there is no bacteriological confirmation, he should be listed as "suspect" and put under surveillance.
- Education of the patient by the physician and by auxiliary personnel, to ensure that all medical instructions are complied with.
- Organization of services to prevent interruptions in the medication supply, and surveillance and follow-up of cases.
- Home visits, to prevent patients from abandoning treatment.

Inadequate treatment does more harm than good to the community, since the bacillus ends by developing resistance. This increases the danger of transmission and fails to eliminate cases as sources of infection. Insufficient doses, irregular use of drugs, and lack of effective supervision have created a large number of carriers of resistant bacilli who besides endangering the public are a burden on the dispensaries and hospitals. When treated in sanatoriums these patients go on receiving the same drugs, which no longer have any effect. After a while they return to the community, bringing with them the same risk of transmitting resistant bacilli as before they were temporarily isolated. With the sources of contagion undestroyed, the opportunity of protecting the community is lost.

Differentiated Medicine

Even though specialized services do not always keep adequate records of daily activities (which would make possible a quantitative evaluation of their work) or of the number of patients receiving drugs monthly or using them regularly, and even though the patients and their contacts are not sufficiently supervised, the individual clinical approach—aimed at giving good-quality services to a minority—prevails over the public health approach, which attempts to care for the majority of the population with simpler and more economical methods, techniques, and procedures. As a result, a few interesting cases receive good medical care, a certain number receive poor care, and most of the population gets no help at all.

In order to avoid this situation, efforts must continue toward organizing the means and resources available, making full use of local preventive and curative services, preventing duplication of effort, improving efficiency, and reducing operating costs.

Summary

In a tuberculosis campaign conducted in Nicaragua (population 1,569,716), 134,265 tuberculin tests were given throughout the country, to 29,241 persons living in Managua and 105,024 persons living in the remainder of the country; 99,063 persons were given BCG vaccinations, and the treatment of cases and chemoprophylaxis of contacts were begun. The majority of the population examined were in the age group 0-19 years.

Tuberculin positivity, which was 23.7 per cent, tended to increase with age (15.3 per cent among those from 0 to 19 years and 48.6 per cent in the age group 20 and over), and was lower among females: 49 for women between 40 and 49 years, but more than

62 for men in that age group.

Of the persons examined in Managua, 30.8 per cent were found to be tuberculin-positive, as were 23.1 per cent of those in the other departments of the country. The collected data indicate that there are 129,049 positive reactors in the age group 0-19 years, and 352,986 in the group 20 years and above.

Of the tuberculin-positive persons, 4,093 were X-rayed; 1.84 per cent were found to be active tuberculosis cases. Their treatment was begun immediately. The highest case frequency was recorded in persons whose tuberculin reactions measured from 10 to 15 mm in diameter in all the age groups under 50 years. It is estimated that in the tuberculin-positive group between 0 and 19 years there were 1,678 (1.3 per cent) active tuberculosis cases, and in the age group 20 years and above, 8,472 (2.4 per cent).

The authors recommend that the organization of existing means and resources be continued with a view to making more efficient use of local preventive and curative services, preventing duplication of effort, improving the efficiency of services, and reducing operating costs.