DECLINE OF LEPROSY IN A GROUP OF NIGERIAN VILLAGES BETWEEN 1941 AND 1956[1]

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INTRODUCTION

Ndi Oji Abam is a group of villages in Eastern Nigeria of unusual interest to the leprologist. Here, in conditions of relative isolation, live 3,000 people in seven communities, engaged traditionally in agricultural pursuits but with increasing interest in trade during recent years. In 1941 an intensive leprosy survey revealed an exceedingly high level of prevalence, and it became possible through the sustained cooperation of the people to follow the course of the disease year by year under the various influences that came to bear upon it. Surveys repeated in 1947 and 1955 provided an exact picture of the situation at those times and a check on observations made during intervening years. The findings after 16 years of observation are recorded here.

ORIGINAL SURVEY, 1941

Our first contact with the people of this district was at their invitation. Here as elsewhere in this Eastern Region of Nigeria leprosy was dreaded more than any other disease, but during the 1930's it had increased to such an extent that the people were ready to do anything to control it. The suggestion of a survey as the first step in this direction was welcomed, and after suitable explanations this was undertaken in March of 1941. Cooperation in this enterprise was excellent. As we went from house to house there was no attempt at concealment, and with few exceptions the whole population was examined completely stripped. It is worth while to record the findings of this survey in detail. Table 1 gives the general prevalence of the disease, and Table 2 the classification of the cases found. These findings contain a number of points of interest.

1. *Population.*—The number of persons examined, 3,057, represents more than 99 per cent of the actual resident population. This very high proportion is indicative of the unity and sense of social responsibility displayed by the people concerned, among whom the inroads of civilization were as yet superficial.

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[1] Although the author was responsible for the initiation of the work described in this paper, and for its continuity from 1941 to 1951 and from 1954 to the present time, it is evident that nothing short of a group of workers could have done all that is described here. It is in the name of that group that this paper is written. Those who have shared in this work for longer or shorter periods include Drs. C. M. Ross, B. Nicholson, K. Seal, M. Corcos, K. Ellis, and C. Stone, and Messrs. F. W. Tuck, L. R. Dalton, K. Okpi, E. Kalu, S. Ubani, J. Achilefu, and T. Apu.

It will be noticed in Table 1 that females outnumber males, a common finding at that time, reflecting the better expectation of life enjoyed by females in a society in which life was hazardous. There is also evidence of the high mortality rates in childhood and among the elderly. The unduly large number of people in the 30-39 age group may be explained in part by the fact that few individuals knew their age, and in the assessment of age by the examiner the greatest margin of error was liable to occur between the ages of 25 and 45.

2. *General prevalence of leprosy.*—The extremely high prevalence of leprosy, 121 per mille, is of an order rarely encountered outside tropical Africa. High as it is, the figure is a conservative one (materially lower than the figure of 170 reached in 1943, as will be related). In a com-

TABLE 1.—*Prevalence of active leprosy, 1941, by sex and age groups, in population examined.*

Sex and total	Age groups (years)									
	0-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60+	Total
	1. *Population examined*									
Males	250	237	178	96	179	200	177	92	41	1,450
Females	251	250	154	127	270	276	166	93	20	1,607
Total	501	487	332	223	449	476	343	185	61	3,057
	2. *Cases found*									
Males	0	14	17	12	22	52	12	8	0	137
Females	0	15	15	9	55	95	32	7	4	232
Total	0	29	32	21	77	147	44	15	4	369
	3. *Prevalence per mille*									
Males	0	59	95	125	123	260	68	87	nil	95
Females	0	60	97	71	197	344	193	75	n. s.	144
Total	0	60	96	93	171	309	128	80	—	121

munity riddled with yaws and a wide variety of fungus infections, great care was taken to diagnose as leprosy only those cases which presented cardinal signs of the disease. Two important groups were thereby excluded, both of which were later found to be fruitful sources of definite cases. One group consisted of individuals who presented either ulcers or scars resulting from the application of caustics to skin lesions, the nature of which was thereby obscured. It is extremely unlikely that people sensitive to leprosy and skilled in its diagnosis would submit to such treatment of mere yaws or tinea lesions. We were told clearly that when a macule appeared which was suspected to be leprous, it was a common practice to cauterize it by chemical or other means, and we were introduced to a local "doctor" who specialized in this treatment. The second

group consisted of individuals with very early lesions, bacteriologically negative to routine examination by the scraped incision method and exhibiting no signs of nerve involvement. Such early indeterminate lesions were not recorded as active leprosy for purposes of the survey but were kept on observation, and needless to say numbers of these individuals later presented unequivocal signs of the disease.

TABLE 2.—*Type distribution of leprosy cases, 1941 survey Madrid classification.*

Type of leprosy	Age groups (years)								
	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60+	Total
Lepromatous									
Macular	2	0	1	1	3	5	2	0	14
Diffuse or nodular									
Early	0	0	0	1	1	0	0	0	2
Moderate	0	1	1	1	3	0	0	0	6
Advanced	0	0	0	3	0	2	0	0	5
Totals	2	1	2	6	7	7	2	0	27
Indeterminate									
Single lesion	6	1	3	4	10	1	2	0	27
Multiple lesions	5	8	4	12	24	6	1	0	60
Totals	11	9	7	16	34	7	3	0	87
Borderline	0	1	0	0	3	2	0	0	6
Tuberculoid									
Macular, single	0	2	1	7	19	7	0	2	38
Macular, multiple	0	1	1	2	4	1	0	0	9
Minor, single	9	8	8	30	56	12	9	2	134
Minor, multiple	4	10	2	14	21	8	1	0	60
Major, single	3	0	0	0	1	0	0	0	4
Major, multiple	0	0	0	2	2	0	0	0	4
Totals	16	21	12	55	103	28	10	4	249
TOTALS	29	32	21	77	147	44	15	4	369

3. *Type distribution.*—The picture of the disease shown in Table 2 contains several notable features.

(*a*) The low proportion of frank lepromatous cases is of interest. Although they constituted only 8.8 per cent of the total cases, they nevertheless represented 9 per mille of the population—an absolute value which would be considered high in many countries. A low ratio of lepromatous cases in relation to other forms of the disease is a common finding in hot moist climates. Thus Lowe (8), working in East Bengal, found 18 per cent lepromatous and 82 per cent neural types among 438 cases of the disease. With a more modern classification the proportion of lepromatous cases would probably have been smaller.

(*b*) The general rarity of advanced degrees of any of the main types is also noticeable. The reason for this will be discussed later.

(*c*) Major tuberculoid and borderline varieties of leprosy were also rare.

(*d*) Pure polyneuritic cases were nonexistent and therefore that class does not appear in the table.

(*e*) The dominant types of leprosy encountered were macular, of varieties indicating only mild degrees of tissue reaction. Many showed sufficient definition, sensory involvement and signs of spontaneous healing to warrant a classification of minor tuberculoid, but cases classified as macular tuberculoid and those with indeterminate macules were also numerous, every gradation being met between minor tuberculoid lesions on the one hand and frankly prelepromatous macules on the other hand.

(*f*) The frequency of patients who displayed only a single macule is also remarkable. They represented 57 per cent of the whole.

(*g*) Among patients with multiple macules, a large indeterminate group is noticeable. Many of these were of a kind that commonly degenerates to the lepromatous condition.

4. *Childhood rate.*—The low childhood rate among the patients, 16.6 per cent, associated with an exceedingly high general prevalence, is worthy of comment. With many early cases among adults it is clearly indicated that susceptibility to infection was not confined to childhood and youth. In relation to the population the frequency of the disease in childhood was indeed very high, 60 per mille in the 5-9 age group and 96 per mille in the 10-14 age group. This is very high indeed, much higher than was found by Lowe in India, or by Guinto and Rodriguez (7) in the Philippines.

5. *Sex rate.*—Another interesting finding is the equal distribution of the disease between the sexes. Here it is not true that males were more susceptible than females. Females did not lead secluded lives, but moved about as freely as men, and had the same chances of contact.

6. *Comment.*—How is this picture of leprosy to be interpreted? The findings taken as a whole suggest that we were confronted, not by a disease which had been endemic for generations, but rather by an unstable situation associated with an epidemic of short duration, still in its ascendancy, and not far from its peak. Both the subsequent evolution of the disease and recent immunological studies support this conclusion.

Conditions for the spread of leprosy in this community were certainly ideal. After generations of isolation, contacts with surrounding people and freedom of travel were increasing rapidly. Little clothing was worn. Yaws and scabies were universal among the lower age groups. The villages were built on a defensive basis, and overcrowding was general. In such conditions it was impossible for any disease that is spread by contact to remain localized, and leprosy was no exception. The ultimate result was

an exceedingly high level of infection in a population poorly equipped to resist it.

LATER DEVELOPMENTS

Such was the situation in 1941. There was clearly here a situation of great epidemiological interest, but we could not continue to study it as disinterested observers, for the people needed help. Therefore, a central outpatient clinic was opened, at which every patient found on the survey was enrolled. A leprosy inspector was sent to live in the area and to encourage patients to attend voluntarily for treatment. Close to the clinic an isolation village of advanced hygienic pattern was built, sufficient in size to accommodate all open cases and such others as needed ulcer dressings or other medical attention. A patient-nurse was sent to live there, and soon gathered around him a nucleus of patients which grew rapidly. The people offered, to patients willing to isolate themselves, special farming privileges around this village. With the leprosy inspector visiting contacts and observation cases, inspecting newcomers, and undertaking his own periodic surveys, it was possible for visiting doctors and other workers to keep in touch with the situation and ensure that control measures did not lapse after the first flush of enthusiasm had passed.

SURVEYS OF 1947 AND 1955

In following the course of the disease through succeeding years precise information is available as to the situation in January 1947 when the whole population was resurveyed, and again in January 1955 when the survey was again repeated. The numbers of cases found in these surveys are shown in Table 3, distributed by age groups. The type distribution was as follows:

Type	1947	1955
Lepromatous	23 (10.0%)	5 (10.2%)
Indeterminate	49 (21.3%)	13 (26.5%)
Borderline	15 (6.5%)	1 (2.2%)
Tuberculoid	143 (62.2%)	28 (57.2%)
Polyneuritic	0 (0%)	2 (4.1%)
Total	230	49

TABLE 3.—*Prevalence of leprosy, 1947 and 1955 surveys; active cases found.*

Year	Population examined	Age groups (years)									Cases per mille
		5-9	10-14	15-19	20-29	30-39	40-49	50-59	60+	Total	
1947	3,025	10	29	23	29	76	56	12	5	230	76
1955	2,940	0	3	4	11	12	10	9	0	49	17

Both of these surveys were carried out with the thoroughness exercised in 1941, and on both occasions the people gave the same degree of coopera-

tion. The figures cover all patients found with active leprosy, including those isolated and visitors from other places. Special efforts were made to trace every patient found on the previous survey, and it may be said that everyone still living at Ndi Oji was seen and examined. Patients whose disease was in a residual condition are not included in the list of those showing active disease.

There can be no doubt whatever as to the validity of these findings. They indicate clearly that a decline in leprosy incidence has occurred; it was already pronounced in 1947, but by 1955 it had increased to such proportions that patients with active leprosy then represented only 13 per cent of the number found in 1941.

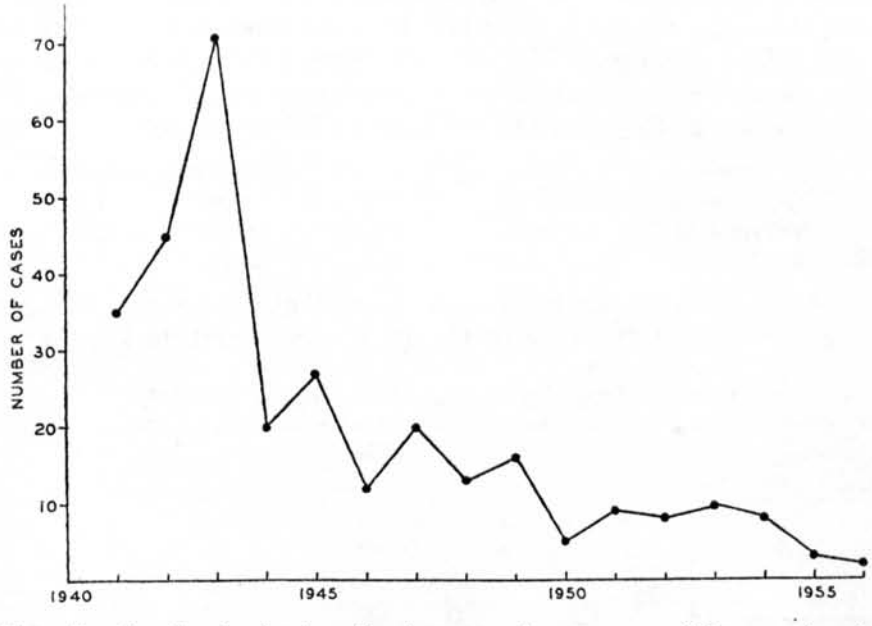
At each of these later surveys it was discovered that the numbers of patients who were failing to avail themselves of the continuing treatment facilities were very small. In 1947 only 18 out of 230 patients with active disease had failed to come forward for treatment on their own initiative. Several were recent newcomers to the district. In 1955 the corresponding figures were 8 out of 49. This situation was suspected before the surveys were undertaken because, with the exception of newcomers from outside, new patients coming to see the doctor on his visits presented mostly very early cases, usually with a history of only two or three months duration, and it was evident that very little attempt was being made to conceal the disease. This fact is important, for it indicates that, year by year, the records of the leprosy control organization are valid, and they give a broad picture of the situation between the surveys.

In discussing the possible reasons for the decline in leprosy in this area, it is convenient first to consider those factors that contribute to an increase in the amount of leprosy, and then to consider factors aiding its decline. The first category includes new infections, the evolution of the disease in the individual, and external influences. The second category includes deaths among leprosy patients, removals from the area, immunological factors, improving hygienic conditions, and the influence of leprosy control measures.

FACTORS FAVORING THE INCREASE OF LEPROSY

1. *New infections.*—Shortly after the 1941 survey was finished, fresh cases of active leprosy began to appear, some from among those presenting suspicious but indefinite signs at the survey, others from among those examined and found fit. By the end of 1941, 35 such new cases had been registered. In 1942 this development increased, and in 1943 it reached its peak, with 71 new cases recorded during that year, 69 of them in persons examined at the survey. By the end of that year the over-all prevalence had reached the high point of 170 per mille. Thereafter the number of new cases recorded declined rapidly as shown in the following list, in which the cases discovered during the 1947 and 1955 surveys are included. These data are presented graphically in Text-fig. 1.

Year	Cases	Year	Cases	Year	Cases
1941	35	1946	12	1952	8
1942	45	1947	20	1953	9
1943	71	1948	13	1954	8
1944	20	1949	16	1955	3
1945	27	1950	5	1956	2
(Av. 39.6)		1951	9	(Av. 6.0)	



TEXT-FIG. 1.—Graph showing the decrease of new cases of leprosy found each year, 1941-1956.

It is of interest to observe the distribution of the new cases among the various age groups. In Table 4 they are divided into four broad age groups, and figures are given by three-year periods. It will be noted that in the

TABLE 4.—*Age distribution of new cases, 1941-1955.*

Period	Childhood 0-14 years	Young adults 15-29 years	Middle age 30-49 years	Later life 50+ years
1941–1943	51	48	45	9
1944–1946	19	19	19	2
1947–1949	7	10	30	2
1950–1952	5	3	12	2
1953–1955	3	8	6	3
Totals	85	88	112	18

two earlier periods there are no significant differences between the first three age groups, but that in the next two periods the middle age period

predominates; the childhood figures were then relatively low, and they continued low in the last group.

The types of leprosy in the new cases seen after 1941 are shown in Table 5, which is to be compared with Table 2 for the cases found in the original survey. The percentages given below show that there was an evident decrease in the frequency of lepromatous cases (which were relatively few anyhow), but that otherwise there was no material difference between the original survey cases and the later ones. On the other hand, when the later cases are divided into two groups there is seen a tendency to increase of indeterminate cases and decrease of tuberculoids, which supports the belief that there is little lag in the reporting of new cases.

Type	1941	1941-1955	1941-1946	1947-1955
Lepromatous	7.3	2.6	3.3	1.1
Tuberculoid	67.4	69.0	71.3	63.8
Indeterminate	23.3	27.1	24.7	33.0

The data presented supply adequate proof that leprosy was very active in the community at the time of the 1941 survey and during the years

TABLE 5.—*Type distribution of new cases, 1941-1955.*

Type of leprosy	1941-1943	1944-1946	1947-1949	1950-1952	1953-1955	Totals
Lepromatous						
Macular	5	1	1	0	0	7
Diffuse or nodular	1	0	0	0	0	1
Totals	6	1	1	0	0	8
Indeterminate						
Single lesion	17	10	11	4	3	45
Multiple lesion	20	5	7	1	4	37
Totals	37	15	18	5	7	82
Borderline	1	1	0	0	0	2
Tuberculoid						
Macular, single	8	1	1	1	0	11
Macular, multiple	1	0	0	0	0	1
Minor, single	73	30	18	10	8	139
Minor, multiple	17	5	6	5	2	35
Major, single	6	5	3	1	0	15
Major, multiple	4	1	2	0	1	8
Totals	109	42	30	17	11	209
Polyneuritic	0	0	0	0	2	2
TOTALS	153	59	49	22	20	303

immediately following it. The figure of 51 new cases among children between 1941 and 1943 speaks for itself. (It includes one child 2 years old, another of 3 years, and 14 of six years or less.) The susceptibility of all ages is well illustrated. The high proportion of patients presenting single

macular lesions is also noteworthy. The most striking feature, however, is the sharp fall in the number of new cases which occurred in 1944, and the generally low and declining level of new infections since then.

Regarding the sources of new infections, amid a great deal of pertinent information it is sufficient to note two facts. (*a*) Although lepromatous cases were relatively few, their importance from the standpoint of the spread of leprosy was out of all proportion to their number. (*b*) In many compounds new infections ceased entirely with the passage of time. Where they did continue to arise it has been found increasingly in recent years that individuals presenting new infections had either spent periods away from their homes or were formerly very closely associated with lepromatous cases.

2. *Evolution of leprosy in individual patients.*—Clinical records and the follow-up of patients show that while no change occurred in the type of leprosy exhibited by a majority of patients, there did in a minority occur changes of which some were of a degenerative character. These changes in most cases arose during treatment with hydnocarpus oil. Of a total of 31 patients who showed either extension of the disease or a change in type in the direction of the lepromatous, 14 were originally classed as indeterminate and 17 as tuberculoid. Reactivation after apparent resolution was encountered in 41 patients, of whom 37 were tuberculoid in type—7 macular tuberculoid, 27 minor, and 3 major. In spite of these occurrences it is noteworthy that 89 per cent of indeterminates, 98 per cent of macular tuberculoids, 96 per cent of minor tuberculoids, and 87 per cent of major tuberculoids showed no change other than resolution.

Two features worthy of further comment are, (*a*) the chronicity of minor tuberculoid leprosy, and (*b*) the epidemiological importance of puberty and childbearing. Minor tuberculoid lesions were very stable, many very chronic, but they had a tendency to fresh extension after apparent resolution following hydnocarpus oil treatment. The same smouldering type of infection was witnessed in the few patients with single minor tuberculoid lesions who did not take treatment. When seen again at a subsequent survey, in 2 such cases the lesions had resolved spontaneously. The importance of puberty and childbearing where extension of the disease is concerned is shown by the fact that among the 21 cases in which there was a change of type which would be regarded as of a degenerative character, at least 11 were associated either with puberty or lactation.

3. *External influences.*—Having considered what might be termed the intrinsic factors favoring the spread of leprosy, the effect of leprosy infections introduced into the area from outside calls for examination. We are concerned here with (*a*) leprosy introduced by newcomers to the district, and (*b*) leprosy introduced by Ndi Oji people returning home from abroad.

(*a*) The influence of newcomers to the district: During the 1941 survey a number of strangers from other places were found living at Ndi Oji,

some trading in the villages, others living in small groups on farmland or in forest. Their interest from the standpoint of this study lies in the fact that among them 30 cases of active leprosy were found and included in the survey figures, including 3 advanced lepromatous ones and several very long-standing cases.

The reason for their presence was soon evident. At that time it was a widespread custom to drive persons with leprosy from their homes. For these unfortunates Ndi Oji offered a most desirable place of refuge, with its ample land and kindly, hospitable people. A small but navigable river running through the area provides an unobtrusive route of entry for such strangers, especially for those coming from villages along its upper and lower reaches.

During succeeding years the comings and goings of these people continued, and every year fresh leprosy cases were introduced from this source, a total of 143 being encountered during the 16 years. There was here a potentially important factor in the spread of leprosy, without doubt making its contribution to the situation in 1941. Thereafter its influence obviously waned, because while new leprosy infections continued to be introduced into the area year by year, the number of new cases in the resident population shrank to an insignificant number.

(*b*) The influence of residents returning home: In some villages of the group it is a common practice for young men to travel away to centers of trade in the Region, stay for a few years, and then return to their homes. If any such person developed leprosy he usually hurried home, and every year a few cases entered the district from this source. Their influence was small, as they were usually in the early stages and treatment was sought without delay.

FACTORS FAVORING THE DECLINE OF LEPROSY

1. *Mortality of leprosy patients.*—A glance at the population figures in Table 1 is sufficient to indicate the hazardous nature of life at Ndi Oji in 1941, especially among the young and the elderly. Among leprosy patients, during the 10 years 1941 to 1950, deaths were: 1941, 4; 1942, 19; 1943, 35; 1944, 20; 1945, 13; 1946, 14; 1947, 7; 1948, 7; 1949, 5; 1950, 9.

During the first few years of this study the mortality rate was high, especially among the lepromatous cases and the severe cases generally. Once the disease had a firm hold on an individual his downhill course was usually rapid, mainly because the will to live was lost, the grave psychological effects of the disease all too often robbing the patient of the initiative needed to maintain physical fitness. The outlook of patients rapidly improved with medical care and the interest taken in them, but at the time of the survey and immediately afterwards patients with severe disease had a short life—a fact which tended to limit the new infections for which they might have been responsible. The significant point is that during succeeding years the deterioration of early cases was arrested, and this accounts for the rapid decline in mortality among the patients.

2. *Removal of leprosy patients from the area.*—This possible factor in the decline in leprosy can be dismissed in a few words. In all but a very few cases, once a person at Ndi Oji showed signs of active leprosy he stayed at home where treatment was available, and did not move away until the disease had become residual. The only exceptions to this were the few patients who were transferred to distant leprosy settlements. As there were only 4 of these during the 1941-1943 period, they cannot have influenced the decline in the disease to any appreciable extent.

3. *Immunological factors.*—We are concerned here with two important factors, (*a*) the influence of tuberculosis, and (*b*) increasing resistance to the infection.

(*a*) The influence of tuberculosis: The isolated position of the Ndi Oji villages in former years makes it most improbable that any extensive infection of the community with tuberculosis can have taken place before 1941. Nevertheless, tuberculosis is now increasing in the Eastern Region of Nigeria. In order to obtain information of its extent at Ndi Oji, a tuberculin survey has been undertaken of the entire population of the four largest villages of the group, lepromin tests being made at the same time. This work is being reported on elsewhere. Suffice it to say here that clinical tuberculosis is still rare, and there is no satisfactory evidence that, at its present level in the community, tuberculosis is exerting any appreciable influence on sensitivity to lepromin. The tuberculin-positive rate among present and past leprosy patients was just as high as it was among the general population. There is no evidence that the decline in leprosy can have been caused by cross immunity to tuberculosis.

(*b*) Increasing resistance to the leprosy bacillus: The susceptibility of people of all ages evident in 1941 makes it probable that the epidemic of leprosy in the community was then still ascendant. In these circumstances it is possible that the natural course of the disease would be associated with increasing resistance to infection. However, the results of large-scale lepromin testing carried out in 1957 with *the Lowe purified bacillus antigen* indicate that the level of lepromin sensitivity is still not high. During childhood the proportions of positive Mitsuda reactors increased rapidly, but during adolescence there was a noticeable slowing down, until in adult life a steady level was attained with 65 per cent of the population giving positive reactions.

These results are not such as would be expected in a community having a high degree of resistance to *M. leprae*. Cochrane, Santra and Rajogopalam (2) in South India found 86 per cent of healthy adults and 79.6 per cent of healthy children gave positive reactions to the Mitsuda test. Dharmendra and Jaikaria (4) found a positive rate rising to 98 per cent at Bankura in Eastern Bengal. The Ndi Oji figure is relatively low, and there are no grounds for believing it to have been higher in 1944. Increasing resistance to *M. leprae* does not commend itself as a fact or of any real significance in the decline of leprosy.

4. *The influence of public and personal hygiene.*—During the period under review there has been an undoubted improvement in the standards of hygiene among the people. Like village people everywhere, however, they are conservative and it is only since 1947 that significant changes have occurred. More clothing is worn and there is much greater attention to cleanliness, but as yet there has been very little change in standards of housing. Overcrowding is still rife. A result of this is that yaws is still very common. In a survey undertaken in February 1957 no less than 62.5 per cent of the population of Ndi Oji village showed signs of yaws. Here it is certainly not true that yaws tended to decline in the community as leprosy developed in it. The prevalence of yaws and scabies today indicates clearly that advances in public and personal hygiene are not enough to account for the decline in leprosy from 1944 onwards.

5. *The influence of leprosy control measures.*—Among the leprosy control measures instituted in 1941, two call for discussion here. They are (*a*) treatment, and (*b*) isolation.

(*a*) Treatment: Since 1951, DDS has been the standard drug used in the treatment of leprosy at Ndi Oji. By that time the number of patients had already decreased to a low level. Between 1941 and 1951, i.e., during the years when the greatest decrease occurred, the standard treatment was hydnocarpus oil, given partly intradermally and partly intramuscularly in a standard dose of 6 cc. twice weekly for adults.

Here as elsewhere established lepromatous cases profited very slowly from hydnocarpus treatment, and its therapeutic action on them contributed little or nothing to the decline of leprosy. Indirectly, however, its effect was considerable. It has already been noted that at Ndi Oji only 11 per cent of patients with indeterminate leprosy showed any signs of deteriorating to lepromatous. Untreated, indeterminate cases are all too often the precursers of lepromatous ones. Under hydnocarpus treatment the majority of these patients improved and ultimately resolved, and one of the main sources of lepromatous leprosy thus dried up.

(*b*) Isolation: The isolation of infective cases is the most obvious way of attacking leprosy, but unfortunately it often fails because the method employed is either ineffective or unacceptable to those concerned. The isolation village at Ndi Oji was certainly not unacceptable. Everything was done to make life more attractive there than it was at home. Pleasant surroundings very near to the treatment clinic, some farmland nearby, a friendly resident nurse, treatment for minor ailments, hospital care if needed—such advantages were not to be found at home, and it is not surprising that by 1942 every open case found in the 1941 survey had voluntarily come to live at this village. It did indeed prove popular to more than the open cases for whom it was intended, and varying numbers of advanced indeterminate and tuberculoid cases, especially those with ulcers, sought permission to join the village community, which for several years totalled about 60 people. Healthy persons were strictly excluded.

No attempt was made to enforce rigid rules regarding the movements of isolated patients. They were allowed to visit their homes, and, on occasion, local markets if free from ulceration. The village, however, was their home for the time being, and communal life was encouraged by every possible means. Isolation was thus not irksome. It removed patients from the overcrowded compounds where, as Rogers found long ago, over 90 per cent of new infections were likely to arise from contact with them, but did not cut them off from their families. Two years after village isolation was instituted, leprosy began to decline. There is little doubt that this was a major contributing factor.

In these villages of Ndi Oji we witnessed a very heavy infection with leprosy rising to the exceptionally high level of 170 per mille, and then falling steadily year by year to a low level. At its height the situation was not very different from that which arose in the island of Nauru earlier this century, as Davey, Ross and Nicholson (3) have noted. Of all the factors contributing to the decline in the disease, leprosy control measures appear to be outstanding. There is no doubt that a real sense of social responsibility provided the favorable conditions in which leprosy control work could develop. This was undertaken along traditional lines, but with emphasis on cooperation with the people, persuasion and not compulsion, the treatment of active case, the isolation of open cases, and the follow-up of contacts, residual cases, and new arrivals in the district.

As leprosy has declined, the leprosy control work has become the door through which other rural health services are now developing. Familiarity with leprosy surveys has made it easy for the people to share fully in a systematic survey for yaws. With his specific duties declining, it has become possible for the leprosy inspector to supervise a dispensary for general diseases. The isolation village has become redundant, and will form the site of a newly-developing rural health center, with maternity services to follow. Here leprosy has been a "key" disease, as Muir has described it, the control of which has opened the way to healthier living.

To diverge somewhat, it is to be said that the story of the decline of leprosy told here could be told, with variations, many times over with respect to other places in Eastern Nigeria. There is now no doubt whatever that we are witnessing a large-scale decline of the disease in this part of the country, for survey after survey tells essentially the same story. The important thing is, in view of certain theories of the natural history of leprosy, that tuberculosis has not yet got into these villages to any important extent, certainly not enough to account for the changed leprosy situation today. We were naturally very hesitant at first to ascribe these changes to the leprosy control measures, but there is no reasonable alternative. The situation has been unusual in more ways than one. There must be few places in the world where the people are so willing to act together in helping along the leprosy control work. That has meant a great deal.

SUMMARY

A detailed account is given of the course of leprosy in a group of very heavily infected villages in Eastern Nigeria between the years 1941 and 1956. Conditions for observation were exceptionally favorable. Three surveys in 1941, 1947, and 1955 provided an exact evaluation of the situation at those times, while cooperation of a high order on the part of the people enabled the course of the disease, under the impact of the various influences coming to bear upon it, to be followed year by year.

In the 1941 survey 369 active cases were found, a prevalence of 121 per mille in a population of 3,057, with a low proportion of lepromatous cases and large numbers of early cases involving all age groups and both sexes. During the next two years the prevalence rate continued to rise until it reached a peak figure of 170 at the end of 1943. Thereafter it began to fall. By 1947 it was 76 per mille, and by 1955 it had fallen to 17.

In total, 302 new cases were encountered during the following 16 years of observation. No less than 153 of these were seen between 1941 and 1943, but in 1944 there was a sharp fall and thereafter the numbers of fresh cases each year continued at a low and declining level. Single macular lesions were presented by 57 per cent of the new cases.

The extent, type-distribution and progress of the disease are consistent with the unstable conditions prevailing during the ascendancy of an epidemic rather than with an infection which has been long endemic. In 1941 it must have been approaching its peak. Conditions were then ideal for the spread of the disease, and it is possible that the influx of people with leprosy into the area during the previous decade had an important bearing on the situation.

Possible causes for the rapid and great decline in the disease which started in 1944 are discussed. The results of a recent tuberculin survey make it extremely unlikely that tuberculosis had any part in it. A lepromin survey has shown that in 1957 the level of positive reactors is still not high, and the natural evolution of the disease is unlikely to have been an important factor. Deaths and removals among leprosy patients may have had a small influence, as may improvements in personal and public hygiene. Nevertheless, leprosy control measures, made effective by the great cooperation of the people, appear to have been the decisive factor. Treatment hindered the development of lepromatous leprosy. Simple methods of isolation removed open cases from overcrowded communities. The follow-up of contacts, discharged patients and newcomers into the district, together with periodic surveys, maintained public concern, and together these measures effectively interrupted the course of the endemic.

RESUMEN

Ofrécese aquí una reseña pormenorizada de la evolución de la lepra en un grupo de aldeas intensamente infectadas en la Nigeria Oriental entre los años 1941 y 1956. Las condiciones para observación eran excepcionalmente favorables. Tres encuestas ejecutadas en 1941, 1947 and 1955 suministraron una valuación exacta de la situación

en dichas fechas, mientras que una cooperación de orden elevado de parte de la población permitió seguir de año en año la evolución de la enfermedad bajo el influjo de los varios factores que intervinieron en el problema.

En la encuesta de 1941 se descubrieron 369 casos activos, o sea una frecuencia de 121 por mil, en una población de 3,057 personas, con una proporción baja de casos lepromatosos y grandes números de casos incipientes que afectaban a los grupos de todas las edades y a ambos sexos. Durante los dos años siguientes, el índice de prevalecencia contibuó elevándose hasta alcanzar una cifra cúspide de 170 por mil a fines de 1943. Después comenzó a descender. Para 1947 era de 76 por mil y para 1955 había bajado a 17.

En conjunto, se descubrieron 302 casos nuevos durante los siguientes 16 años de observación. No menos de 153 de éstos fueron observados entre 1941 y 1943, pero en 1944 hubo un descenso agudo y a partir de ahí el número de casos nuevos cada año se mantuvo a un nivel bajo y en declinación. Un 57 por ciento de los casos nuevos presentaba lesiones maculares aisladas.

La difusión, distribución de formas y evolución de la dolencia son compatibles con las condiciones inestables que prevalecen durante el auge de una epidemia más bien que con la situación creada por una infección endémica por mucho tiempo. En 1941 el mal debe haber ido acercándose a su cumbre. Las circunstancias eran entonces ideales para la propagación de la enfermedad y es posible que la entrada de personas con lepra en la zona durante el decenio anterior ejerciera un importante influjo sobre la situación.

Discútense las posibles causas del rápido y gran descenso de la enfermedad, que comenzó en 1944. Los resultados de una reciente encuesta con tuberculina demuestran que es sumamente improbable que la tuberculosis desempeñara el menor papel en ello. Una encuesta con lepromina demostró que en 1957 el índice de reactores todavía no era alto y es improbable que la evolución natural de la dolencia constituyera un factor importante. Las muertes y las mudanzas de los leprosos pueden haber ejercido algún pequeño influjo, e igualmente las mejoras en la higiene personal y pública. No obstante, las medidas de lucha antileprosa, puestas en vigor gracias a la gran cooperación de la gente, parecen haber sido el factor decisivo. El tratamiento impidió la aparición de la lepra lepromatosa. Sencillos métodos de aislamiento eliminaron los casos abiertos de los vecindarios hacinados. La observación de los contactos, de los enfermos dados de alta y de los recién llegados al distrito, unido esto a encuestas periódicas, sostuvo el interés del público, y en conjunto esas providencias interrumpieron efectivamente la marcha de la endemia.

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