# A STATISTICAL STUDY OF 1,000 CASES OF LEPROSY OBSERVED IN RANGOON FOR APPROXIMATELY TWO YEARS

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Leprosy is widely prevalent in Burma. According to a recent inquiry  $(^2)$  there were 3,035 segregated cases, 21,379 unsegregated cases and an estimate of 75,000 unknown cases, or a total of approximately 100,000 in a population of 17.5 million. Two further estimates, one by Tha Saing and Lampe  $(^6)$ , and the other by Viswanathan (unpublished data) place the number of cases at 150,000 and 200,000 respectively.

Twenty years ago, Lowe (<sup>3</sup>) described leprosy in Burma, based on a survey of 315 patients in the Rangoon Leper Asylum and 1,068 case records from the Rangoon Hospital Clinic. In view of the scanty information and conflicting opinions regarding the character of leprosy in Burma, we have made a study of 1,000 cases at the Special Skin Clinic of the Rangoon General Hospital. The data have been transferred to punch cards, analyzed and tabulated. This paper describes the methods used and the results obtained, together with a discussion of some aspects of the epidemiology and treatment of leprosy.

#### METHODS

From the epidemiologic viewpoint it was felt that in order to provide a sufficient number of cases in each component group (type, sex, etc.), 1,000 cases should be included and each of them should have been under observation for at least 18 months so that the influence of treatment could be ascertained. It is realized that a much longer period is required to obtain observations on complete inactivation.

To fulfill these requirements it was necessary to take cases that first came under observation as early as October 1953, and to include all cases with complete records for 18 months. Thus, no cases were taken that registered in the clinic after June 1955. These cases include approximately 40 per cent of the total number registered during this period. Excluded were cases which came once only for an opinion as to diagnosis, infectiousness, or ability to return to duty; cases which were sent from a distance for consultation; and members of the Army seen in consultation. The average period of observation was about two years, since a greater number of cases came to the clinic in the later months of the period, due to the gradually increasing popularity of the clinic. All cases that were observed for 18 months, whether they came regularly or not, and whether or not they had ceased attending the clinic, were included.

The case histories contain information on the name, sex, occupation and age of the patient, and also his religion and ethnic background. Each card bears a registry number and an up-to-date diagnosis including the type, duration and degree of the disease, including the occurrence of deformity, also of any previous therapy (usually indigenous remedies), and of known contacts. Smears are taken from several sites. In tuberculoid and indeterminate cases it was assumed that originally negative bacteriologic findings would not change to positive in the absence of an exacerbation. When the original smear was positive in such cases, and in all of the lepromatous type, the examination was repeated at intervals of approximately six months.

The classification employed in this clinic is that which was recommended by the WHO Expert Committee (<sup>7</sup>), although in actual practice no cases were diagnosed "borderline" and the indeterminate classification was applied to simple macular cases with or without polyneuritic manifestations. A few cases of active tuberculoid leprosy were at first taken to be a lepromatous, but because of rapid progress under treatment the diagnosis was scrutinized and corrected.

The degree of infection was diagnosed according to conventional standards. Regardless of age, type or degree, all patients except those in reaction were put on ascending doses of diaminodiphenyl sulfone (DDS). After a few weeks on 25 mgm. daily, the dose was increased to 50 mgm. and later to 75 or 100 mgm. daily, depending upon the body size. Children were given proportionately smaller doses. Patients with erythema nodosum leprosum reactions, and those with reaction in tuberculoid leprosy, were given intravenous injections of potassium antimony tartrate (PAT). If neuritis developed, it was usually treated with injections of Sulphetrone or hydnocarpus oil along the affected nerve trunk.

The case records were transferred to punch cards designed to record, in as small a space as possible, the most important details such as those already mentioned, as shown in Text-fig. 1. With regard to the bacteriologic findings, since smears were taken from several sites it was decided to record only the most strongly positive findings. The term "inactive" was applied to tuberculoid cases when the lesions had become flat and faded, to indeterminate cases when the lesions had faded, and to lepromatous cases when they had been bacteriologically negative for one year. Although the disease may have become arrested in some of these cases, it was too early to make such a diagnosis.

After the records had been transferred to punch cards, they were sorted with a needle and analyzed with special attention to the ethnic group, sex and the differences between children (under 14 years of age) and adults. Percentages have not been calculated when the numbers of individuals were less than 20, and the percentage figures were placed in parentheses when the numbers of cases were less than 75 (double parentheses in the tables as set up).

#### RESULTS

### TYPE, AGE AT ONSET, AND AGE AT REGISTRATION

In the entire series of 1,000 cases, 45 per cent were of the tuberculoid type, 23 per cent were indeterminate, and 32 per cent lepromatous. Among the tuberculoid cases one-fourth had only a single lesion, and four-fifths were free from deformities. In other words, there was a large proportion of early and less-severe cases among the patients involved in this study.

An analysis of the age at onset of leprosy and the age at registration in the clinic, compared with the percentage of the general urban population falling within each age group, is given in Table 1. It may be seen that the percentage of onset in any age group corresponds with the percentage registered in the next higher age group. Thus the age at onset was roughly five years earlier than the age at the time of registration. In subsequent tables only the age at the time of registration is mentioned, but this may be interpreted through reference to Table 1.



TEXT-FIG. 1. Punch card used in the analyses reported.

The proportion of cases with onset in the 0-4 age period is much smaller than the proportion of that age group in the population. At age 5-9 the two percentages are about equal. In the 10-29 group the proportion of cases with onset of leprosy is higher than the proportion in the population, but after that the proportion of onset cases is, if anything, lower than the proportion of the population. According to convention, the childhood rate is computed from the age at which the disease comes under observation, and would be 17 per cent in this series. However, if the age of onset were used for this calculation, the childhood rate would be 29 per cent.

In Table 2 the age at time of registration is broken down into separate figures for the three forms of leprosy. It may be seen that at the age 0-4 only tuberculoid cases were found, while at 5-9 there was a fair number of indeterminate cases as well. In the age group 20-24 and on-

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wards there were more lepromatous than tuberculoid or indeterminate cases.

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When an analysis was made of the duration of illness before coming to the clinic, the median value was found to be about 2 years in tuberculoid cases, 3-1/2 years in indeterminate cases, and 4 years in patients with the lepromatous type. The duration of illness was found to be closely related to the proportion of cases showing deformity, as shown in Table 3, more closely in the lepromatous and indeterminate cases than in those with the tuberculoid type. In fact, this relationship was more exact than then the correlation between age and the percentages of cases showing deformity.

### OTHER FACTORS AFFECTING INCIDENCE

Of the patients studied 54.9 per cent were Burmese, who constitute 65 per cent of the Rangoon population, while 33.5 per cent were Indians, who comprise only 15 per cent of the population.

A further breakdown, according to ethnic group, is given in Table 4, where the so-called type, sex, and childhood rates are shown. Only the difference in type rate between Burmese and Indians is statistically valid, the former having more lepromatous leprosy than the latter. Listing the four major population groups in order of the prevalence of leprosy among them—Indian, Muslim-Burmese, Burmese, and Chinese—it is interesting to note that this is just the reverse order of the type rate—Chinese, Burmese, Muslim-Burmese, and Indian.<sup>1</sup>

The ratio of male to female cases was broken down according to age group. At 0-9 it was 27/27, or 1.0; at 10-14 it rose to 70/47, or 1.5; at 15-19 it was 109/44, or 2.5; at 20-24 it was 115/54, or 2.1; at 25-29 it was 94/34, or 2.8; at 30-39 it was 148/41, or 3.6; while at 40-49 it was 92/31, or 3.0; and it then fell at 50-59 to 42/25, or 1.7.

In Table 5 the ratio of males to females is broken down according to the type of the disease. Apparently the disproportion in the number of males is greatest in the lepromatous type, and especially in the older age groups where there were several times as many cases in males as in females. Furthermore, in this series there were no females over 40 with the lepromatous type who manifested deformities, while deformities were not uncommon among the male patients.

### FACTORS AFFECTING THE SEVERITY OF THE DISEASE

One of the factors which may increase the severity of the disease is the duration of illness prior to registration and the beginning of treatment. An analysis with respect to the interval between onset and registration has given figures for male and female Burmese that are almost

<sup>&</sup>lt;sup>1</sup>Because the minor ethnic groups are too small to be dealt with separately in further analyses, they are dealt with as Burmese hereafter.

identical. The Indians seem to have a slightly shorter history of infection than the Burmese. The most marked difference was found for the children, who-not surprisingly-had a much shorter duration of illness. Actually 19 per cent of them, compared with 8 per cent of the adults, had a history of less than one year; while only 12 per cent of them compared with 48 per cent of the adults had a history of four years or longer.

In Table 6 the degree of the disease of each type and the incidence of deformity are analyzed with reference to the major case groups. There are few differences between Indians and Burmese, or between males and females, with the indeterminate or tuberculoid forms of the disease. However, in the case of the lepromatous type the Burmese (and especially the male Burmese) have higher grades of the disease and larger proportions of cases with deformity. The children show a higher proportion of tuberculoid cases, and lower frequencies of deformity in all types.

The data on the initial bacteriologic status of the lepromatous cases, in Table 7, confirms the impression that the lepromatous infection, which has been seen to be more common in Burmese than Indians, is also more severe. The degree of bacteriologic positivity was the same in male and female Burmese, but less in the children. The changes in status at the end of the period of observation are also shown in the table (but see Table 9).

## FACTORS AFFECTING COURSE UNDER TREATMENT

Treatment was sometimes complicated in the lepromatous cases by ENL reactions, and in the tuberculoid cases by either a reactional state or the development of neuritis of such severity as to warrant injections along the nerve trunks. The frequency of these events, as well as the proportions of cases becoming inactive, are shown in Table 8. It is seen that tuberculoid reactions were more common in Burmese than in Indians, and least frequent in children. Similar but more marked differences in the same direction appear with regard to ENL reactions in the lepromatous cases. As for nerve reactions, 50 per cent more of the Burmese patients required injections of PAT than of Indian patients, and the proportion requiring two or more injections of PAT was three times as great in the Burmese as in the Indians. Finally, it is noteworthy that the proportion of cases which became inactive at the time of this analysis was much higher in children than in adults.

Further analysis of the data on reactions has shown that the number of tuberculoid cases with such episodes was related to the age of the individuals, with increasing percentages from 7 in the 10-19 year group to 34 in the 40-59 group, but there was no such relationship to duration of the disease before treatment. Among the lepromatous cases those with ENL reactions showed no relationship to either age or duration. The proportions of cases becoming inactive showed a close relationship with

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both of these factors, the younger groups and those with shortest duration showing the higher percentages of inactives.

Another factor which showed a correlation with the course under treatment was the presence or absence of deformity. Among the cases without deformity some 40 per cent became inactive, while of those cases with deformity only 15 per cent had become inactive at the time of this analysis.

The cases were also analyzed from the viewpoint of regularity of treatment. A slightly better total result was achieved in those patients with tuberculoid leprosy who attended the clinic regularly, but even those who attended irregularly showed good results. On the other hand, among the lepromatous cases the proportion becoming inactive fell from 6 to 2 per cent when the treatment was irregular, and none of the patients who lapsed from treatment became inactive.

The results of the initial and final bacteriologic examinations are analyzed in more detail in Table 9 than in Table 7, because it gives more precise information. From this it will be seen that none of the tuberculoid or indeterminate cases deteriorated bacteriologically, and of those with positive initial smears only 0.6 per cent (3 cases) failed to show improvement. Among the lepromatous cases, 87.2 per cent improved, 12.2 per cent remained unchanged, and 0.6 per cent (2 cases) deteriorated. Returning to Table 7, it may be seen that bacteriologic improvement in lepromatous cases was most striking among the children, and that there was little difference between males and females. Slightly better results were achieved in Indians than Burmese.

### EFFECTS OF REACTIONAL CONDITIONS

The reactional state in the tuberculoid type of the disease was more likely to occur in patients with more than one lesion (Grade 2) than in patients with a single lesion (Grade 1), as shown in the first part of Table 10, but the frequency was not affected by the presence of deformity. It is interesting to note that the percentage of cases becoming inactive during the period of observation was considerably lower in the group with reaction than among those patients who escaped this complication. Furthermore, the reactional cases had reached the same bacteriologic status at the end of the study as that of the uncomplicated cases at the start.

From the second part of Table 10 it may be seen that the reactions (ENL) in the lepromatous cases were not related to the advancement of the disease or the presence of deformity. When ENL reactions occurred there was a greater tendency for the development of neuritis despite the use of intravenous PAT. Furthermore, the proportion of cases becoming inactive at the time of the report was reduced from 8 to 3 per cent among the patients who had had such reactions. In fact, only 7 per cent of the lepromatous cases developing ENL reactions became bacteriologically

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negative, compared with 25 per cent of those which did not have this complication.

#### DISCUSSION

Type of leprosy, age and duration of illness.—In this series of 1,000 cases, the figures of 32 per cent lepromatous and 45 per cent tuberculoid are, respectively, the lowest and the highest that have been reported for Burma. Thus our findings bear out the statement of the assistant director, Burma Leprosy Campaign, quoted by Doull and Derrom  $(^2)$ , that "as more cases are detected the lepromatous rate goes down."

Our figures for the age at time of registration are similar to those which have been reported by others (<sup>4</sup>), but the information on the age at onset is unique, and indicates the importance of leprosy in childhood.

The observation that duration of illness was shorter in tuberculoid cases than in other types was confirmed by the fact that in the age group 0-4 only tuberculoid cases were found, and in the 5-9 group these cases pre-dominated.

The correlation between duration of illness before coming to the clinic and the percentage of cases with deformity is important, because cases with deformity are more difficult to treat and take longer to reach an inactive stage.

Ethnic factors.—It is well known that as leprosy infection becomes less intense the lepromatous rate rises ( $^{5}$ ). Our figures on prevalence and the lepromatous rate in Indians, Muslim-Burmese, Burmese, and Chinese bear out this hypothesis. It has been suggested that our finding of a higher prevalence of leprosy among Indians than Burmese is due to the modesty of Burmans, which might prevent afflicted individuals from coming to the clinic. However, the lower lepromatous rate and higher childhood rate in Indians as compared with Burmese cannot be explained on this basis, and until evidence to the contrary is adduced it would seem plausible to accept the clinic figure as an approximate indication of the relative prevalence of leprosy among Indians and Burmese living in the vicinity of Rangoon.

There is nothing in our figures to support the contention that old Burmans suffering from leprosy are rare, that there are very few cases of neural leprosy among adult Burmese, or that the Burman has less natural resistance than the Indian (<sup>3</sup>). The higher incidence of leprosy in Indians than in Burmese probably reflects conditions in that part of India whence the patient or his parents had migrated.

The only important ethnic finding which we have seen is the greater tendency for Burmese to develop reactions, especially the ENL reaction. This factor may account for the better results in the treatment of the lepromatous disease in Indians, since our data show that ENL reactions are detrimental to the course of the disease.

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The sex factor.—Our figures comparing male and female, and especially male and female Burmese, are interesting because in Burma the women are often exposed to the same stresses as men. One would expect little difference between the number of males and females with leprosy if the occupational status were the determining factor.

However, our analysis shows that the ratio of cases in men to women increases from unity at ages below 10 to over three in middle ages and then falls slightly at the age of 50. This disproportion is even greater when attention is focused on the lepromatous cases, and among the latter deformities were more often noted in males.

It seems apparent from the sex ratio at different ages that the difference in frequency of leprosy in men and women occurs at that time in life when hormonal differences are also most striking. In support of the hypothesis that the difference in frequency of leprosy among males and females is the result of hormonal factors, are the repeatedly reported clinical observations that leprosy in women often appears for the first time or relapses some months after delivery, rather than during pregnancy.

The age factor.—Because the age of onset is much earlier than the age at registration in the clinic, it is likely that the majority of cases are contracted in childhood, becoming apparent some five years later and leading to an appearance at the clinic almost five years after that.

While it may be true that if the lepromatous infection in children is left untreated it progresses rapidly, this analysis shows that with DDS therapy the results in children are better than in adults. Certainly among children there are, proportionately, many fewer cases of tuberculoid and ENL reactions. The low incidence of deformity and the good results of therapy in childhood leprosy are probably related to the relatively short duration of the disease.

These findings indicate the importance of discovering and treating all cases of leprosy in the juvenile population, and the need to include a search for leprosy in the school health program of those countries which have a high prevalence of this infection.

Treatment with DDS.—The type of analysis which we have employed, recording the bacteriologic findings of each patient on a punch card, made it possible to prepare Table 9, which gives a precise indication of changes of the bacteriologic status during the period of observation and treatment. It shows at a glance what percentages of cases deteriorated, remained unchanged, or improved. This method of analysis is recommended when the differences in treatment regimes are being studied, and a numerical value for assessment is desired  $(^1)$ .

The importance of DDS therapy as a cause of the beneficial results is shown by the facts that the proportion of cases becoming inactive in the lepromatous group was much reduced when treatment was irregular, and that none of the lepromatous cases which lapsed from attendance at

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the clinic became inactive. It is of interest that small doses of DDS, never more than 100 mgm. daily and often only 50 mgm., were given.

Role of reactions.—With regard to tuberculoid leprosy the age of the patient, the advancement of the disease, and the positivity of bacteriologic findings were correlated with the frequency of reactions. Although it has been stated that the reactional state in tuberculoid leprosy may precede clinical improvement (<sup>5</sup>), it is apparent from our analysis that reactions delay bacteriologic improvement and decrease the numbers of cases which become inactive within a given period of time.

The chief factors which lead to an increased frequency of ENL reactions are ethnic group, age over 15 years, and duration of the disease beyond one year. Thus this kind of reaction seems to depend more on the individual susceptibility than on the severity of the disease. It is well known that the ENL reaction retards the beneficial effect of DDS therapy since it necessitates discontinuing the treatment for a time, and our results bear out this conclusion.

#### SUMMARY

The records of 1,000 cases of leprosy followed for an average of two years have been analyzed with the aid of punch cards. The type distribution of cases was 45 per cent tuberculoid, 23 per cent indeterminate, and 32 per cent lepromatous. The disease was most frequently noted by individuals of the 10-14 age group, although the group which came to the clinic in greatest numbers was 20-24. From data on the age of onset it appears that the percentage of leprosy was greater than the population percentage during the ages 10-39.

The tuberculoid type occurred earlier than the others, and the history was shorter. In all types the percentages of cases with deformity increased with increase of age and duration of illness. The incidence of leprosy in Rangoon and environs was highest among Indians, next in Muslim-Burmese, less in Burmese and least in Chinese; while the lepromatous rate was in the reverse order. The occurrence of ENL reactions was twice as frequent in the Burmese as in the Indian patients with lepromatous leprosy.

Between the ages of 12 and 60, leprosy was much more common in males than in females, the disproportion being most marked in lepromatous cases. In the latter type, the frequency of deformities was also greater in males than females. Children had a higher proportion of tuberculoid and a lower frequency of lepromatous cases, and a much lower deformity rate. Tuberculoid reactions were one-half as common, and ENL reactions one-fourth as common, in children as in adults. Under treatment the proportion of patients reaching an inactive stage was considerably higher among children than adults.

Results of treatment with DDS were influenced by the age of the individual and the duration of the disease. In tuberculoid cases with de-

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formities or with reactions, the efficacy of treatment was lessened. In lepromatous cases the occurrence of ENL reaction interfered markedly with improvement in the clinical condition and bacteriologic status, as did irregularity of treatment.

One-third of all cases reached an inactive stage, with faded lesions in tuberculoid and indeterminate cases, or negative smears for a year in those of the lepromatous type. The bacteriologic status of lepromatous cases improved in 87.2 per cent, remained stationary in 12.2 per cent, and deteriorated in only 0.6 per cent. Actually 17.5 per cent became negative.

The chief factors involved in the occurrence of tuberculoid reactions were age, degree of infection, and positivity of bacteriologic findings. The factors involved in the ENL reaction were ethnic background, age, and duration of illness. Both of these types of reaction had a deleterious effect on the disease.

From the public health viewpoint, early diagnosis and treatment, especially in children, is stressed.

#### RESUMEN

Con la ayuda de fichas perforadas se han analizado los protocolos de 1,000 casos de lepra, mantenidos en observación durante un promedio de dos años. La distribución por formas de los casos fuè de 45 por ciento tuberculoideos, 23 por ciento indeterminados y 32 por ciento lepromatosos. La enfermedad fué notada con la mayor frecuencia en el grupo de 10-14 años de edad, aunque el grupo que acudió a la clínica en mayores proporciones fué el de 20-24 años.

La forma tubercloidea se presentó antes que las otras y tenía historia más breve. En todas las formas los porcentajes de casos con deformación aumentaron al subir la edad y la duración de la dolencia. La incidencia de la lepra en Rangoon y alrededores alcanzó su máximo en los indios, viniendo después los muslimes burmeses, después los burmeses y al final los chinos, en tanto que la tasa lepromatosa siguió el orden contraio. La ocurrencia de reacciones ENL fué el doble en los burmeses que en los indios que tenían lepra lepromatosa.

Entre las edades de 12 y 60 años, la lepra fué mucho más común en los varones que en las mujeres, siendo la desproporción más notable en los casos lepromatosos. En esta forma, la frecuencia de deformidades fué también mayor en los varones que en las mujeres. Los niños tuvieron una proporción más alta de casos tuberculoideos y menor de caos lepromatosos y un coeficiente mucho más bajo de deformidad. Las reacciones tuberculoideas fueron 50 por ciento menos comunes y las ENL 25 por ciento menos communes en los niños que en los adultos. Bajo tratamiento, la proporción de enfermos que pasó a la etapa inactiva fué considerablemente más alta entre los niños que entre los adultos.

Los resultados del tratamiento con DDS se vieron afectados por la edad del individuo y la duración de la enfermedad. En los casos tuberculoideos con deformidades o con reacciones, disminuyó la eficacia del tratamiento. En los lepromatosos, la aparición de reacciones ENL afectó decididamente la mejoría del estado clínico y del bacteriológico, haciendo otro tanto la irregularidad del tratamiento.

La tercera parte del total de casos pasó a una etapa inactiva, con lesiones descoloridas en los casos tuberculoideos e indeterminados o frotes negativos durante un año en los de la forma lepromatosa. El estado bacteriológico de los casos lepromatosos mejoró en .87.2 por ciento, permaneció estacionado en 12.2 por ciento y no deterioró más que en 0.6 por ciento. En efecto 17.5 por ciento se volvieron negativos.

Los principales factores que figuraron en la aparición de reacciones tuberculoideas fueron la edad, la intensidad de la infección y la positividad de los hallazgos bacteriológicos. Los que intervinieron en la reacción ENL fueron la procedencia étnica, la edad y la duración de la dolencia. Ambas formas de reacción ejercieron efecto nocivo sobre la enfermedad.

Desde el punto de vista sanitario, recálcanse el diagnóstico y el tratamiento tempranos, sobre todo en los niños.

#### REFERENCES

- DOULL, J. A. Clinical evaluation studies in lepromatous leprosy. First series: Diasone (Diamidin), 4,4'-diaminodiphenyl sulfone, dihydrostreptomycin. Internat. J. Leprosy 22 (1954) 377-402.
- DOULL, J. A. and DERROM, D. World distribution of leprosy. 1. Leprosy in Southeast Asia; Burma. Leprosy Briefs 7 (1956) 37.
- LOWE, J. A note on racial variations in leprosy with particular reference to Indian and Burmese races. Leprosy in India 10 (1938) 132-139; also Indian Med. Gaz. 73 (1938) 591-595.
- LOWE, J. and CHATTERJI, S. N. Seasonal variations in leprosy in Calcutta. Internat. J. Leprosy 7 (1939) 137-148.
- MUIR, E. Manual of Leprosy. Edinburg & London: E. & S. Livingstone, Ltd., 1948.
- THA SAING and LAMPE, P. H. J. Leprosy control project in Burma. Leprosy in India 27 (1955) 75 (abstract). (Paper presented to the All-India Leprosy Workers Conference, Jamshedpur, March 1955.)
- 7. WORLD HEALTH ORGANIZATION. Expert Committee on Leprosy; First Report. World Hlth. Org. Tech. Rep. Ser. No. 71, 1953, p. 20.

Age (years)	Age at onset (cases) <sup>a</sup>	Age at registration (cases)	Age of population <sup>®</sup>
0-4	21 (2%)	10 (1%)	14.4%
5-9	94 (9%)	44 (4%)	9.9%
10-14	184 (18%)	117 (12%)	9.7%
15-19	173 (17%)	153 (15%)	11.6%
20-24	127 (13%)	169 (17%)	9.8%
25-29	136 (14%)	128 (13%)	9.6%
30-34	74 (7%)	108 (11%)	7.6%
35-39	65 (7%)	81 (8%)	7.2%
40-44	45 (5%)	64 (6%)	5.3%
45-49	36 (4%)	59 (6%)	4.8%
50-59	31 (3%)	44 (4%)	6.1%
60-69	9 (1%)	23 (2%)	3.9%

 TABLE 1.—Age at onset and at registration, compared with the percentage distribution of the urban population of Burma in 1953.

a Information not available in 5 cases.

b Age distribution of urban population, 1953.

Age (years)	Tuberculoid (cases)	Indeterminate (cases)	Lepromatous (cases)
0-4	10 (2%)	0 (0%)	0 (0)%
5-9	29 (6%)	13 (6%)	2 (1%)
10-14	58 (13%)	30 (13%)	29 (9%)
15-19	66 (15%)	36 (16%)	51 (16%)
20-24	63 (14%)	39 (17%)	67 (21%)
25-29	59 (13%)	24 (11%)	45 (14%)
30-34	47 (10%)	17 (8%)	44 (14%)
35-39	36 (8%)	18 (8%)	27 (8%)
40-44	26 (6%)	17 (8%)	21 (7%)
45-49	30 (7%)	13 (6%)	16 (5%)
50-59	22 (5%)	8 (4%)	14 (4%)
60-69	7 (2%)	10 (4%)	6 (2%)

TABLE 2.-Age at registration according to type of leprosy.

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Interval Tuberculoid Indeterminate Lepromatous (cases) (cases) (years) (cases) 0 7/68 ((10%)) 5/20 ((25%)) 1/10(-)18/52 ((35%)) 6/64 ((9%)) 19/124 (15%) 1 10/45 ((22%)) 2 18/68 ((26%)) 7/32 ((22%)) 3 7/41 ((17%)) 9/22 ((41%)) 16/39 ((41%)) 10/20 ((50%)) 12/32 ((38%)) 4 6/27 ((22%)) 10/27 ((38%)) 14/23 ((61%)) 12/32 ((38%)) 5 5 +41/56 ((73%)) 50/100 (50%) 26/98 (27%) 107/332 (32%) Total 93/453 (21%) 104/225 (46%)

 
 TABLE 3.—Frequency of deformity as related to the interval between onset and registration, by type of case.<sup>a</sup>

a Percentages in double parentheses, as stated in the text, pertain to groups of less than 75 cases. When the number was less than 20, the percentage was not calculated. This applies to all tables.

TABLE 4.-Analysis of ethnic factors with respect to proportions of lepromatous cases (type rate), males (sex rate), and children under 14 years (child rate).

Ethnic group	No. of	Lepromatous		M	ales	Children	
	cases	No.	Type rate	No.	Sex rate	No.	Child rate
Burmese	549	208	38	380	69	82	15
Indian	335	75	22	245	73	62	19
Muslim-	la serence a se						£
Burmese	58	19	((33))	31	((53))	19	((33))
Chinese <sup>a</sup>	44	17	((39))	35	((80))	7	((16))
Other	14	3	()	8	()	2	()

a Including Sino-Burmese.

	Trahan		Indotor	mineto	Lopron	Lonromotour		
Age (years)	Numbers (M/F)	Ratio (decimal)	Numbers (M/F)	Ratio (decimal)	Numbers (M/F)	Ratio (decimal)		
0.14 15-24 25-34 35-69	56/41 88/41 72/34 84/37	$(1.4:1.0) \\ (2.1:1.0) \\ (2.1:1.0) \\ (2.3:1.0)$	24/19 50/25 32/9 49/17	(—) (2.0:1.0) (—) (—)	18/73 85/33 69/20 70/14	() (2.6:1.0) (3.4:1.0) ()		
Total	300/153	(2.0:1.0)	155/70	(2.2:1.0)	242/80	(3.0:1.0)		

TABLE 5.-Analysis of the sex factor with respect to type of the disease, by age groups.<sup>a</sup>

a The ratios in parentheses pertain to relatively small groups; no ratios are given for the smallest groups.

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Type and degree	Indians	Burmese males	Burmese females	Children	Total
Tuberculoid					
Total cases	174 (52%)	137 (38%)	66 (49%)	88 (51%)	453 (45%)
Grade 1	47 (14%)	31 (9%)	17 (13%)	62 (36%)	114 (11%)
Grade 2	127 (38%)	103 (29%)	49 (36%)	26 (15%)	336 (34%)
Grade 3	0 (0%)	3 (1%)	0 (0%)	0 (0%)	3 (<1%)
Deformity	39 (22%)	29 (21%)	16 ((24%))	10 (11%)	93 (21%)
Indeterminate					
Total cases	86 (26%)	72 (20%)	23 (17%)	48 (28%)	225 (22%)
Grade 1	24 (7%)	13 (4%)	6 (4%)	21 (12%)	59 (6%)
Grade 2	58 (17%)	58 (16%)	17 (13%)	25 (15%)	161 (16%)
Grade 3	4 (1%)	1 (<1%)	0 (0%)	2 (1%)	5 (<1%)
Deformity	37 (43%)	36 ((50%))	10 ((43%))	10 ((21%))	104 (46%)
Lepromatous					
Total cases	75 (22%)	151 (42%)	47 (35%)	36 (21%)	322 (32%)
Grade 1	0 (0%)	1 (<1%)	1 (<1%)	0 (0%)	1 (< 1%)
Grade 2	60 (18%)	116 (32%)	36 (26%)	32 (19%)	225 (26%)
Grade 3	15 (4%)	34 (9%)	10 (7%)	4 (2%)	66 (7%)
Deformity	22 (29%)	58 (38%)	8 ((17%))	5 ((14%))	107 (33%)

 

 TABLE 6.-Type and degree of the disease, and frequency of deformity, by major groups.

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TABLE 7.-Bacteriologic status, initial and final, in the lepromatous cases, by major groups.<sup>a</sup>

Bacterio- logic status	Indians	Burmese males	Burmese females	Children	Total
Initial 4+	21 (30%)	61 42%	20 (45%)	9 (29%)	118 (37%)
Final 4+	1 (1%)	6 4%	3 (7%)	0 (0%)	14 (4%)
Initial 3+	29 (41%)	65 44%	20 (45%)	8 (26%)	131 (41%)
Final 3+	11 (15%)	38 26%	12 (27%)	4 (13%)	69 (21%)
Initial 2+	21 (30%)	18 12%	4 (9%)	13 (42%)	52 (16%)
Final 2+	20 (28%)	46 32%	11 (25%)	7 (23%)	87 (26%)
Initial 1+	0 (0%)	1 < 1%	0 (0%)	1 (3%)	2 (<1%)
Final 1+	24 (34%)	32 22%	14 (32%)	6 (19%)	80 (25%)
Initial neg.	0 (0%)	0 0%	0 (0%)	0 (0%)	0 (0%)
Final neg.	12 (21%)	23 16%	4 (9%)	14 (45%)	53 (16%)

a Of the several smears made in each examination, the one with the highest positivity was used in the tabulation.

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Reactions	Indians	Burmese males	Burmese females	Children	Total	
Tuberculoid reactions	25/174 (14%)	33/137 (24%)	15/66 ((23%))	8/88 (9%)	88/453 (19%)	
ENL reactions	12/75 (16%)	60/151 (40%)	19/47 ((40%))	3/36 ((8%))	117/322 (27%)	
Nerve injections	64/335 (19%)	101/360 (29%)	42/136 (31%)	34/172 (20%)	233/1000 (23%)	
Inactive (final)	124/335 (37%)	90/360 (25%)	37/136 (27%)	79/172 (46%)	326/1000 (33%)	

 
 TABLE 8.—Course under treatment, with special reference to reactions, by major groups.

Type of	Initial		Fina	l smear		
leprosy	smear	Neg.	1+	2 +	3+	.4+
Tuberculoid	Negative	86.0	0.0	0.0	0.0	0.0
(442)	1+	4.1	0.4	0.0	0.0	0.0
San Sec.	2+	7.1	0.7	0.2	0.0	0.0
	3+	1.2	0.2	0.0	0.0	0.0
	4+	0.2	0.0	0.0	0.0	0.0
Indeterminate	Negative	97.2	0.0	0.0	0.0	0.0
(216)	1+	1.9	0.0	0.0	0.0	0.0
	2+	0.5	0.5	0.0	0.0	0.0
En El en	3+	0.0	0.0	0.0	0.0	0.0
	4+	0.0	0.0	0.0	0.0	0.0
Lepromatous	Negative	0.0	0.0	0.0	0.0	0.0
(343)	1+	0.7	0.0	0.0	0.0	0.0
	2+	8.9	5.3	2.6	0.3	0.0
	3+	6.6	16.2	14.9	5.3	0.3
	4+	1.3	5.0	11.2	17.2	4.3

 

 TABLE 9.—Complete record of bacteriologic status, comparing the results of initial and final smears, by type of leprosy.<sup>a</sup>

a Of the several smears made in each examination, the one with the highest positivity was used in the tabulation.

	Tuberculoid cases				Lepromatous cases			
Features	Nonreactional		Rea	actional	Nonr	eactional	Reactional	
Total cases	365	(100%)	88 (100%) ·		205	(100%)	117 (100%)	
Advancement								
Grade 1	111	(30%)	3	(3%)	1	(<1%)	0	(0%)
Grade 2	252	(69%)	84	(95%)	163	(80%)	92	(79%)
Grade 3	2	(<1%)	1	(1%)	41	(20%)	25	(21%)
Deformity	75	(21%)	18	(20%)	72	(35%)	35	(30%)
Treatment								
PAT once	0	(0%)	60	(68%)	0	(0%)	40	(34%)
PAT twice	0	(0%)	13	(15%)	0	(0%)	52	(44%)
Total PAT	0	(0%)	73	(83%)	0	(0%)	92	(79%)
Nerve inj.	91	(25%)	27	(31%)	29	(14%)	27	(23%)
Bacteriology	-							
Initial								
4+	0	(0%)	1	(1%)	62	(33%)	56	(49%)
3+	0	(0%)	6	(7%)	83	(44%)	48	(42%)
2+	9	(2%)	26	(31%)	42	(22%)	10	(9%)
1+	9	(2%)	11	(13%)	2	(1%)	0	(0%)
Neg.	340	(95%)	40	(48%)	0	(0%)	0	(0%)
Final								
4+	0	(0%)	1	(1%)	12	(6%)	2	(2%)
3+	0	(0%)	0	(0%)	30	(16%)	39	(34%)
2+	0	(0%)	1	(1%)	46	(24%)	41	(36%)
1+	4	(1%)	2	(2%)	56	(30%)	24	(21%)
Neg.	344	(99%)	81	(96%)	45	(24%)	8	(7%)
Inactive	195	(53%)	26	(30%)	16	(8%)	3	(3%)

 

 TABLE 10.—Analysis with respect to influence of reactions in the tuberculoid and lepromatous cases; comparisons with nonreactional cases.

a Treatment of reactions: PAT once and PAT twice refer to courses of treatment.

b Inactive at the time of analysis.

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