

EPIDEMIOLOGY OF LEPROSY IN HYDERABAD (DECCAN), INDIA

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I. A BRIEF GENERAL SURVEY

DESCRIPTION OF THE COUNTRY AND ITS PEOPLES

The important Indian state of Hyderabad is a large inland area of 82,689 square miles, in the central portion of the table land of the Deccan, lying between $15^{\circ} 10'$ and $21^{\circ} 40'$ North Latitudes and $74^{\circ} 4'$ and $81^{\circ} 5'$ East Longitudes. The elevation varies between 1,000 and 1,800 feet above sea level. There are two great river systems, the Godavari and its tributaries, and the Krishna with its tributaries.

A line drawn roughly through the middle of the state from north to south divides the state into two areas which differ from each other in geological and ethnical characteristics. (See Fig. 1). That to the west is a trappean region inhabited largely by Marathi-speaking people, hence called Marathwara. The area to the east is granite and calcareous and is inhabited mostly by speakers of Telugu, and is therefore called Telingana.

Marathwara is fairly fertile because of the black cotton soil produced by the decomposition of the trap. The soil holds the water and is suitable for cultivation of wheat, jawari, and cotton without irrigation. The soil of Telingana, derived mostly from granite, is less fertile as it does not hold the water. Consequently irrigation is necessary for the production of crops, the chief of which is rice. The average rainfall of the state is about 30 inches, most of this falling in the months of July, August, and September. Marathwara has less rain than Telingana.

The total population in 1921 was 12.5 millions, the density of the population being 150 per square mile. The one great occupation of the state is agriculture. In Marathwara most of the land is cultivable but there is no irrigation, so the population is spread over a wider area. In Telingana there is much rock sandy soil and forest;

a smaller proportion of the land is cultivable and then usually only with irrigation, hence the population is more concentrated on the cultivated lands. The total population of the two areas is roughly the same.

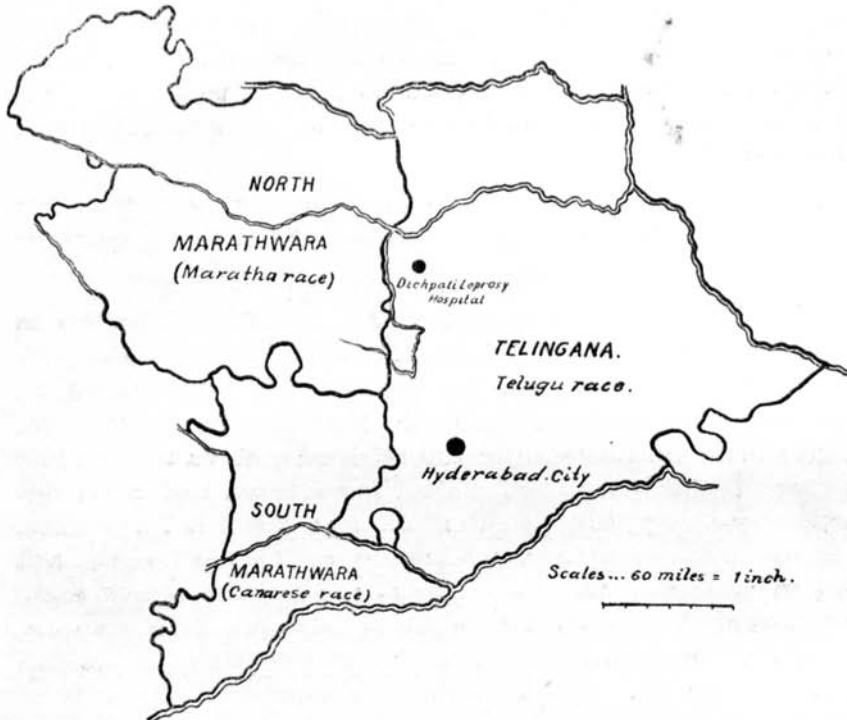


FIG. 1.—Outline map of H. E. H. the Nizam's Dominion of Hyderabad, India, showing the areas occupied by the three principal races and the location of the Dichpali Leprosy Hospital.

Climate.—The climate of Hyderabad is hot and very dry during most of the year. There is usually a marked difference between the day and night temperatures, the shade temperature in the day sometimes rising in the hot season to 110°F. but falling at night to about 85°F. In the rainy season (July to September) the temperature falls, the humidity rises, and there is less difference between the day and night temperatures. In the "cold" weather (November to January) the maximum day temperature is often below 80°F. On the whole, for a tropical country the climate is very healthful.

Towns and villages.—Of the 12.5 million people in the state, 1,200,000 (9.5 per cent) live in "towns" of 5,000 people or more and

the remainder (90.5 per cent) live in villages. There are 21,223 of these villages, of which 13,362 have less than 500 inhabitants, 7,230 have between 500 and 2,000, and 631 have between 2,000 and 5,000.

Crops.—In Marathwara there are fully two main crops, the kharif and rabi (monsoon and cold season crops). In Telingana there are, in addition, the first and second rice crops, abi and tabi. The principal articles grown in Telingana are rice, jawar, bajri, sesamum, and pulses. Those of Marathwara are wheat, cotton, jawar, bajri, and oil seeds.

Diet.—The diet of the people in the two main divisions is roughly determined by the crops. In Marathwara wheat, jawar, and bajri are the staple diet. In Telingana rice is the staple diet.

Housing.—The number of houses in the state is recorded as 2,714,000, with an average of 4.5 persons to each house, but the term "house" is defined as a building occupied by one commensal family. Now in rural areas each commensal family usually occupies one room, so the number of houses really means the number of rooms. If under the joint family system five families live under one roof in five different rooms, each with a separate entrance, this building is called 5 houses. Thus on the average between 4 and 5 people live, eat, and sleep in one small room. The buildings have mud floors, mud walls, and roofs of either rough tiles or leaves, according to the means of the family. Most houses are little more than mud huts, a few feet square in area, with no windows and no ventilation. There is no drainage or sanitary system, and livestock live in and around the houses. The resulting insanitary, overcrowded housing conditions can be imagined.

Race.—Marathwara in its northern part is occupied largely by Marathi-speaking people, who form 27 per cent of the total population of the state. The Marathas are a different race from the Telugus, with a different origin. They originate from the Rattas, a tribe holding political supremacy in the Deccan in very ancient times. The Mahrattas claim to be of Rajput descent and there is probably a mixture of Rajput blood in them. They are a strong, virile, independent race of people, much more so than the Telugus and the Canarese. The southern part of Marathwara is occupied largely by Canarese-speaking people, one branch of the Dravidian race which has occupied South India from the beginning of history. The Canarese form 12 per cent of the total population of the state. They are a

much less virile race than the Mahrattas, and are said to be very poor owing to the poor nature of their country. Telingana is occupied mostly by Telugu-speaking people, another branch of the Dravidian race. They form 50 per cent of the population of the state. They also are a less virile people than the Mahrattas.

The Mohammedans, who form 11 per cent of the state population, are the descendants of the Mohammedan conquerors of the Deccan. They are found mostly in the towns. Considering themselves a superior race, many of them think it is beneath their dignity to do manual work, and many of them are very poor. Large numbers occupy petty administrative posts under the Government, which is a Mohammedan one.

Literacy.—Only 3 per cent of the population can read and write. This is the lowest percentage in India.

LEPROSY IN HYDERABAD AS A WHOLE

There is no accurate information concerning the prevalence of leprosy in the state as a whole. The 1921 census gives a figure of 4,124, with 2,970 males and 1,224 females. The inaccuracy of these figures may be judged from the following facts:

1. We have been consulted in Dichpali and Hyderabad City by about 5,000 leper patients during the last eight years. These must be a mere fraction of the total number of lepers in the state.

2. The figure in 1921 census for Hyderabad city is 65. We have seen at least 600 patients who live in the city. As many as 150 have been seen on one day.

3. The figure for the whole of the Nizamabad District in the 1921 census is 493. This includes the patients in the Dichpali Leprosy Hospital. We have records of 600 leper patients living in the villages of the Nizamabad Taluq, which is only one of the five taluqs of the District, and this 600 is not the whole. Including Dichpali Hospital there are undoubtedly over 1,000 lepers in this one taluq, and it is not exceptional. We believe that leprosy is even more prevalent in the Armur Taluq.

4. In British India, in places where accurate leprosy surveys have been made, it has been found that the 1921 census figures sometimes have to be multiplied by five or even by ten to give anything like the correct figure.

The only area of the state for which we have any accurate figures is the Nizamabad Taluq of the Nizamabad District. A brief leprosy survey of about 122 villages with a total population of 60,000 was made in 1929, and no less than 500 cases were found. This gives a leprosy rate of about 1 per cent, and more accurate investigation would undoubtedly show a still higher rate.

We do not believe that the leprosy rate in the Nizamabad Taluq is a fair index of that throughout the state. Some areas undoubtedly have a rate of more than 1 per cent, while others have very little leprosy. For the whole state the rate may be roughly estimated at 0.5 per cent, which gives a rough figure for the number of lepers in the state as 60,000. This is more than ten times the number recorded in the 1921 census. As previously stated, it is frequently found in British India that the true number of lepers is ten times the census figure. It is quite impossible for any non-medical authority to get any sure estimate of the number of lepers in a large area such as Hyderabad.

Leprosy and race.—The proportions of the four main racial divisions of the population have already been given, and their distribution in the state. The Dichpali Leprosy Hospital is situated fairly centrally; it is actually in the Telugu area but it caters for leper people of all races and many come from the distant parts of the state. It should be possible, therefore, by studying the races of the patients coming for admission, to form some idea of the relative prevalence of the disease among the different groups. Allowance must be made for the institution being in the Telugu area, and near the Mahratta area. Table 1 gives the race of the patients coming here, together with the percentage of the various races in the state.

TABLE 1.—*Proportions of races at the Dichpali Leprosy Hospital.*

Race	Per cent in State	Per cent in institution
Telugus	50	65
Mahrattas	27	8
Canarese	12	12
Mohammedans	11	15

The Telugus would be expected to be most numerous in the institution, as is the case. The Mahrattas, who inhabit an area not far removed from the institution, show a far smaller number of patients here than the number of this race in the state would lead one to

expect. This indicates that leprosy is less prevalent among them than among the Telugus, and what other information we have verifies this. Leprosy is not common among the Mahrattas of Hyderabad.

The Canarese form only 12 per cent of the total population of the state, and they occupy an area which is hundreds of miles distant from the institution. It is surprising, therefore, to find that 12 per cent of our patients here are Canarese. This indicates that the incidence of leprosy in the Canarese people is high, and this idea is verified by reports from Raichur, Gulbarga, and Bidar, where doctors have frequently remarked on the large number of lepers to be found.

The percentage of Mohammedan patients is higher than the percentage of Mohammedans in the state, which fact indicates a high leprosy rate among them.

We therefore believe that the relative prevalence of leprosy in the state is highest among Canarese, next highest among Mohammedans, comparatively low among the Telugus, and lowest among the Mahrattas.

Leprosy and caste.—A similar investigation can be made regarding the relative frequency of leprosy among the different castes. The details are given in Table 2.

TABLE 2.—*Distribution of Cases by Caste at the Dichpali Leprosy Hospital.*

Caste	Per cent in State	Per cent in institution
Brahmins	2.2	1.0
Chatryas	less than 1	1.0
Vysyas	12.7	3.0
Sudras	56.2	38.5
Panchamas	14.0	40.0
Mohammedans	11.0	14.5
Hill tribes, etc.	4.9	2.0

The figures show that leprosy is comparatively infrequent among the higher castes, that its prevalence among the Sudras (cultivators) and the hill tribes is comparatively low, that it is prevalent among Mohammedans, and most prevalent among the depressed classes—the Panchamas, who show a proportion of lepers three times greater than the proportion of this class in the state would lead one to expect.

Leprosy and sex.—In the leprosy hospital the proportion of males to females is about 4 to 1. During the last eight years the

number of males admitted has been 2,044 and females 340, a proportion of 6 to 1. In village survey work, and out-patient clinic work, similar figures are found. Do these figures indicate the true distribution of leprosy between the two sexes? Almost certainly not. Most of the survey work has been done by male workers and Indian village women, in addition to their usual seclusion, are often reluctant to be examined by male doctors. This factor partly explains the low figures for leprosy among women, but we do not believe that it explains it entirely. Women doctors in Hyderabad have found a lower incidence among women than among men. We are inclined to believe that leprosy there is at least twice as common among men as among women, and that this difference is found at all age periods. We are carrying out some further investigations regarding the sex incidence of leprosy.

II. A BRIEF EPIDEMIOLOGICAL STUDY OF FOUR HUNDRED CASES

In order to build up a rational leprosy prevention system it is most desirable that accurate investigations be made concerning the conditions under which the disease spreads. This was strongly emphasised by the Leonard Wood Memorial Conference, held in Manila in 1931.

Unfortunately, we have not available the necessary data to make possible an accurate epidemiological survey of leprosy in Hyderabad. However, during more than eight years of leprosy work there, during which time we have seen several thousand cases, we have acquired certain ideas on the matter. In order to test the accuracy of these general impressions we have made very careful inquiries regarding the 400 patients who are at present in the hospital.

Method of inquiry.—The following information has been collected: Race, caste, source of infection if traceable, age at which the first sign appeared. Regarding the history of the disease in the family, or the history of close contact with lepers, it is not easy to get accurate information. The patient may not know, he may have known and forgotten, or he may know and not be willing to tell, especially if he suspects that under the information some action may be taken to segregate other lepers in his family. In this institution these difficulties are minimised. We are a voluntary, non-government institution, with no compulsory powers. We already know something of the family history of some of our patients, as we have examined their relatives and have their records. In spite of this we have acted with caution. We called together a group of the more responsible patients, explained

to them carefully what information we wanted and what we wanted it for. Then, gradually and carefully, over a period of some weeks, we collected the information, interviewing each patient in private and questioning him thoroughly but tactfully. The resulting information is given hereunder. We do not believe it is absolutely accurate, but we believe it is sufficiently accurate to draw certain broad conclusions.

RESULTS OF INQUIRY

Source of infection.—Leprosy is a disease which is probably conveyed by the dissemination of *Mycobacterium leprae* from a patient suffering from leprosy, the organism later being inoculated into the skin or mucous membrane of a "contact". This transmission is favoured by intimate contact with infective lepers for long periods. One would naturally expect that transmission would most commonly occur from husband to wife and vice versa, and from parents to children. We find, from the data given in Table 3, that this is not so. Conjugal infection is very rare, and infection from parents is not nearly as common as one might expect; infection is more commonly contracted from other relatives not parents. We attribute this to the "joint-family system."

TABLE 3.—*Source of Infection in 400 Cases.*

Family Infection				Conjugal		Other inhabitants of same house	No history of contact
Mother	Father	Sister	Brother	Husband	Wife		
27	51	7	15	1	—		
6%	13%	2%	4%	0.25%		126	173
25%						32%	43%

The "Joint Family" system.—This system, which we believe is one of the principal agencies in the spread of leprosy, is usual in India. Under it several related families live in one house. It is common to find a father and mother with several married sons and their families living under one roof, for when a son marries he brings his wife to his father's house and there brings up his family. When a daughter marries she goes to the house of her husband's father. These Indian houses are frequently crowded with members of three or occasionally more generations of the same family.

If leprosy appears in a member of a family before the age of marriage, marriage cannot take place as no one will knowingly marry his son or daughter to a leper. Not only the sufferer from leprosy but other members of the family find marriage difficult or impossible, as the mere suspicion of leprosy in the family is sometimes an insuperable bar to marriage of its members. If leprosy appears in the wife after the marriage but before there are children, a divorce is usually obtained and the wife returns to her father's house. If the husband develops leprosy, the wife may or may not be able to meet the cost of divorce. Sometimes she runs away to her family home. If there are children to the marriage before leprosy appears in one of the parents, the family ties often keep them together.

As long as there is no marked nodulation or trophic lesion, there is usually no attempt at segregation in the joint family home. When marked lesions appear the sufferer is usually provided with separate eating and drinking utensils, but contact with healthy members of the family continues. Only when the sufferer has marked ulceration and deformity is separate accommodation provided and close contact avoided.

Thus we find that:

1. Lepers rarely marry.
2. If they are married when the disease appears, the family often breaks up and the affected member returns to the joint family house.
3. In either case the affected person usually lives in the joint family house where there are often other families with young children.
4. Contact is not avoided until the disease is advanced.

These conditions are almost ideal for the spread of leprosy. These facts explain some of the rather curious findings demonstrated in the table. In 400 cases, leprosy was contracted from parents in only 78, from brothers or sisters in only 22, but from other relatives living in the same house in 125. These other relatives either have never left the family house or else have returned to it because they had leprosy.

History of contact.—After careful inquiry a history of close contact with lepers was obtained in 227 out of 400 patients, or 57 per cent. No history of close contact was obtained in 43 per cent though as previously said, this does not necessarily mean that no such contact occurred. Contact was admitted by 87 per cent of the women and girls, 65 per cent of the boys under sixteen, and only

48 per cent of the men. This may be taken to mean that women are more truthful than men, but we think there is another meaning—that females are less susceptible to leprosy than males and so a more prolonged and intimate contact is needed for infection to occur, and this contact is probably remembered. In men a more casual and less lengthy contact may cause infection, and it may not be realised that contact has occurred. The fact that with increasing age a lower percentage gave a history of contact perhaps indicated that the contact and infection possibly occurred in early life and have been forgotten.

Conjugal infection.—One of the most striking facts brought out in this inquiry is the extreme rarity of conjugal infection. Of our 400 cases only one gave such a history. This is in accord with all our experience of leprosy. It is rare to find man and wife both suffering from leprosy, even when there has been prolonged cohabitation with a partner who is discharging large numbers of bacilli. A few cases of leprosy in both wife and husband have either of two interesting facts. Either both partners had leprosy before marriage, or else both had leprosy in their families. Though as stated lepers rarely marry, there are exceptions, and it is not very uncommon for a couple with leprosy to marry. Also, if there is leprosy in two families, marriage, which would otherwise be difficult or impossible in either family, is arranged between the members of these two families, and the disease may show itself later in both man and wife. Thus when both man and wife have leprosy, conjugal infection is not often the cause.

However, we have seen in eight years about 6 cases of genuine conjugal infection, and since leprosy is commoner among males, the usual occurrence is the infection of the wife from the husband; we have seen only one case of infection of husband from wife. A careful investigation of these cases of conjugal infection shows one very interesting fact, namely, that the "contact" usually develops a mild form of the disease, and it rarely develops into an infective form. A usual finding is that the man is a C-3 case, the woman an N-1 or N-2 case. The children may or may not develop leprosy, but if they do, it frequently takes a severe form.

Time of onset.—The comparative rarity of conjugal infection indicates a fact the importance of which has not been sufficiently recognized, namely, that adults of both sexes are relatively if not completely immune to leprosy. This idea is difficult to reconcile with

the fact that leprosy is commonly first recognised in adult life. We therefore investigated with some care the time of the appearance of the first symptom suggestive of leprosy in this series of 400 cases.

TABLE 4.—*The time of onset of symptoms in 400 cases.*

Age at onset	Percentage of patients	Total percentage at various ages
1 - 5	5.9	5.9
6 - 10	12.63	18.53
11 - 15	20.70	39.23
16 - 20	19.64	58.87
21 - 25	19.10	77.97
26 - 30	13.98	91.95
30 - 35	5.10	97.05
36 - 40	1.34	98.39
Over - 40	1.61	100.00

In round figures the disease appeared by the age of 10 years in 20 per cent of the cases, by 15 years in 40 per cent, by 20 in 60 per cent, by 25 in 80 per cent, and by 30 in 92 per cent. These figures are, of course, based on the patients' own observations. It is probable that careful medical examination would have revealed signs some time before the patient recognised them. We therefore consider it probable that clinical leprosy appears in most cases before the age of twenty.

Latent Period.—It has long been recognised that there is a latent period of variable duration between the time the infection has been contracted and the time of appearance of clinical signs. Rogers and Muir believe that this period averages about two and a half years, but this figure is based on evidence which is far from conclusive. Latent periods of 10 to 20 or even 40 years have been reported. Our own general impression is that latent periods of 10, 15, or more years duration are not rare, although it is very difficult to prove this conclusively. We believe:

1. That children are susceptible to leprosy infection.
2. That adults are usually immune to leprosy.
3. That the infection is usually contracted in childhood.
4. That the infection usually shows itself clinically by the age of 20.
5. That in some cases in which the disease does not show itself till later in life, the infection was probably contracted in childhood and there has been an unusually long latent period.

III. THE PREDISPOSING CAUSES OF LEPROSY

Muir in his writing has repeatedly and rightly emphasized the importance of maintenance of the *general health* in protecting individuals and communities against leprosy. Leprosy rarely appears in people who are otherwise strong and healthy.

In some communities such diseases as syphilis, chronic dysentery, chronic malaria, and hookworm infestation seem to act as potent predisposing causes. In Hyderabad, owing largely to its dry, healthful climate, chronic parasitic diseases are not common. Syphilis probably acts as a predisposing cause of leprosy in some cases, but we find that only about 16 per cent of our patients give a positive Kahn test, a figure which is little if any higher than the rate among the general population. Thus the predisposing cause here is not, as a rule, some chronic intercurrent disease. We believe that such predisposing causes here must be sought in other directions, and that the most important are bad social and hygienic conditions and bad diet. We have already discussed the influence of the joint-family system in the spread of leprosy. This system is not confined to one caste but is common to all castes. The result is that the housing conditions of most of the people are appallingly bad. The houses are small, badly lighted, badly ventilated, and over-crowded. These conditions are slightly better among the higher castes, who are usually better off and more enlightened. Thus we find that leprosy is less common among them than it is among the lower castes, and it is most common among the lowest caste of all, the Panchamas or depressed classes, who are usually the poorest.

The influence of such conditions is possibly seen in the high leprosy rate among the Canarese. The area they occupy is on the whole the poorest and least productive part of the state, they are poor, and their living conditions are said to be the worst in the state.

Occupation apparently influences the spread of leprosy. It is less common among the cultivators (Sudras) than among other classes. The Sudras lead a more healthy outdoor life than others, and they are also more prosperous, which two facts together probably explain the relatively low incidence of the disease. It tends to be more prevalent among those who follow less healthful occupations; we have found it common among oil pressers, weavers, and others who follow the more sedentary indoor occupations. The high incidence among Mohammedans of the poorer sort is possibly partly caused by the

unhealthful conditions of living. They do no manual labour but usually occupy petty administrative posts on very small pay.

It is an open question whether *race* influences the incidence of leprosy. The strongest, most active, and virile race in Hyderabad is probably the Mahratta, and they show a lower incidence rate than any other. This may be due partly to the better diet which they usually take.

The influence of *diet* on leprosy has been noted by various observers. Generally speaking, there are two staple diets in Hyderabad. With Telugus the staple food is rice; with the Mahrattas and the Canarese it is *jawari*. Leprosy is apparently much more common among the rice-eating Telugus than among the Mahratta jawari-eaters, but the Canarese jawari-eaters probably show the highest rate of all. The Mohammedans take a more mixed diet but show a comparatively high rate. Thus an influence of diet is not clearly demonstrated in Hyderabad, but we consider that bad, ill-balanced diet is one of the predisposing causes of leprosy here. On the whole, the diet of the rice-eating people is markedly deficient in proteins, fats, mineral salts, and possibly vitamins, while the carbohydrate element is in excess. The diet of jawari-eating people has a lower carbohydrate content, and, though still deficient in protein and fats, it is not so much so as that of the rice-eaters.

IV. THE CONTROL OF LEPROSY

It will be seen from the facts recorded in this paper that the control of leprosy is not purely a medical problem. It is even more a social and economic problem. As long as the majority of the people in Hyderabad are poor, ignorant, superstitious, badly fed, and badly housed, so long will leprosy be found among them. We cannot control it merely by treating a certain proportion of established cases. The great thing is prevention, and in the present condition of the people that is difficult or impossible. The improvement of the social and economic condition of the people is a matter that the government should do its best to bring about.

One very necessary part in this work will have to be done by the development of a public health service throughout the state. At present there is no such service. There is only a medical service which, in spite of much improvement in recent years, is still inadequate to do much to improve the health of the people, who mostly live in villages far away from and out of touch with any government medical authority. A public health service to organise prevention of disease in the rural population is most urgently needed. One of the tasks

such a service must attempt is the control of leprosy. This will be done best by the "P. T. S." (propaganda-treatment-survey) system. At present work along these lines is being done in various parts of India. Owing to practical difficulties the results are uncertain and in some places unsatisfactory. The propaganda and survey work, if properly done, will probably yield more results in the long run than treatment work. In propaganda and survey work we should pay particular attention to young people if we are to detect cases in the early stages. Examination of school children where there are schools is of first importance, and also examination of all contacts with lepers, not only members of the same family but all children living in the joint family house. It is also of great importance to teach leper people to practice isolation in their houses and to teach healthy people to insist on some measures of segregation of infective lepers, particularly from young children. The importance of healthy living and diet must be taught and everything possible must be done to improve the social, economic, and physical well being of the people.

It will be said that all this is very good in theory but that the practical difficulties are too great. We agree that the practical difficulties are enormous, and that it will be very many years before they are overcome. We have, however, to face the fact that our present knowledge of leprosy and the results of treatment give us no ground for the belief that the disease can be controlled without overcoming these difficulties.

We would gratefully acknowledge the splendid help given to leprosy work by the Government of H. E. H. the Nizam. This help has been given in various ways. (1) Liberal grants have been given to the Dichpali Leprosy Hospital. (2) A lectureship in leprosy has been established in the Hyderabad Medical School, so that the medical profession may be taught to diagnose and treat leprosy. (3) All the medical officers of the medical service are in turn receiving in Dichpali post graduate training in leprosy work. (4) The men who have received training are encouraged to establish leprosy clinics in the hospitals in which they work. We are very fortunate in Hyderabad in having the support of enlightened administrators keen to help on leprosy work.

In India as a whole we are, it is hoped, at the beginning of a new era in leprosy work. Leprosy hospitals and clinics are doing very good work. There is much propaganda work being done with good results. The public is just beginning to take an interest in the work. The old fear and apathy are beginning to disappear. All this is good, but it is a mere drop in the ocean of what remains to be done. In Hyderabad sufferers from leprosy are numerous, and scattered over so enormous an area, that any attempt to deal with the problem on a large scale is out of the question. Public opinion is not sufficiently enlightened to justify any widespread efforts. Without backing from public opinion any such efforts will be doomed to failure.

What we have to do at present is to lay the foundations on which leprosy work can be built up in the future. We must try to increase our knowledge and improve our treatment of leprosy. We must educate medical opinion. We must try to maintain a high standard in our work; quality is the first consideration, quantity can come later. Above all we must study the facts, avoid unreasoned optimism and pessimism, face the difficulties, and try to overcome them.