

## Risks of Treating Leprosy in a General Hospital<sup>1</sup>

Rachel Mathai, P. S. S. S. Rao, and C. K. Job<sup>2</sup>

The leprosy problem in India is vast. Its 3.2 million patients (<sup>3</sup>) constitute one-fourth of the world's leprosy population. There is a pressing need for effective measures for control of the disease.

Total isolation of leprosy patients to achieve this goal is an ideal theoretical possibility but is not feasible for several recognized reasons (<sup>4</sup>). In a developing country like India, maintaining hospitals, sanatoria, and clinics or doctors and paramedical workers exclusively for treating leprosy is an impractical luxury. Under these circumstances, the need for every doctor to be a competent leprologist and for every clinic and hospital to care for leprosy patients has been often emphasized. However, fear of spreading the infection from leprosy patients to non-leprosy patients and to hospital personnel has prevented most hospitals from admitting leprosy patients without reservation. The purpose of this paper is to study the incidence of leprosy among personnel of a general hospital where leprosy patients are also treated and where no special isolation techniques are utilized for these patients.

### MATERIALS AND METHODS

The study is based on an analysis of cases with leprosy discovered among the staff and students of the Christian Medical College and Hospital at Vellore, South India. This institution is a 1208 bed hospital, situated in an endemic area where, among persons 15 years of age or older, the prevalence of leprosy is 3.4% (<sup>11</sup>) and the incidence is 0.13% per year (<sup>10</sup>). About 4000

leprosy patients are seen as outpatients each year, and about 2% of beds are occupied by leprosy patients at any one time.

From the time of registration until the time of discharge, every leprosy patient shares with others all hospital facilities. These include the registration counter, laboratories, pharmacy, canteen, nursing, medical, and surgical facilities.

The college and hospital has a staff-student strength of 3442, made up of 2665 staff and 777 students. Prior to appointment or admission and annually thereafter, each of these individuals undergoes a thorough medical screening. The categories of staff are shown in Table 1. There are 338 doctors, 523 nurses, and 987 housekeeping personnel. The remaining 817 are in technical, secretarial, and administrative positions. The number of students by type of training is shown in Table 2. There are 313 medical students, 307 nursing students, and 157 paramedical trainees.

The staff and students are drawn from various states as shown in Table 3. Nearly 85% of staff and 34% of students are from the state of Tamil Nadu, in which the institution is situated.

All the students and a large majority of the doctors and nurses live within the institution campus. Other staff, predominantly those from the local area, reside outside the institution. Duration of stay in the institution is given in Table 4. About 30% of the individuals have been with the institution more than ten years and another 24% between six and ten years.

### RESULTS

Of these 3442 individuals who at initial screening had no evidence of leprosy, 24 were later found to have acquired the disease. Among these, 16 had tuberculoid, two borderline, and six indeterminate leprosy. The total attack rate was thus 0.7%. The attack rates among males and females did not differ significantly and were 0.7% and

<sup>1</sup> Received for publication on 30 May 1979; accepted for publication in revised form on 11 April 1980.

<sup>2</sup> R. Mathai, M.B., F.R.C.P., D.D., Professor and Head, Department of Dermatology; P. S. S. S. Rao, M.A., M.P.H., F.S.S., Dr.P.H., Professor and Head, Department of Biostatistics; C. K. Job, M.D., F.A.M.S., F.R.C.Path., Principal and Professor of Pathology; Christian Medical College and Hospital, Vellore-632 004, Tamil Nadu, South India.

TABLE 1. *Distribution of staff by category of work.*

Staff/category of work	Male	Female	Total
Medical	230	108	338
Nursing	13	510	523
Housekeeping	798	189	987
Technical	487	218	705
Secretarial, administration	81	31	112
Total	1609	1056	2665

0.6% respectively. The attack rates by age are shown in Table 5. None manifested the disease below 20 years of age. The highest attack rate (1.2%) was seen in those 50 years of age or older. Attack rates by individual states in India are presented in Table 6. No significant differences were seen. Attack rates by duration of stay in the institution are given in Table 7. Among those with more than 10 years of stay, the rate was 0.7%. Those with six to ten years' stay showed the highest rate of 1.3% while for those with a duration of stay of five years or fewer, it was only 0.4%. This table also shows the attack rates, taking into account the person-years of observation. The overall attack rate is only 0.08 per 100 person-years, with the rates being higher among the more recent employees and lowest among those who have served the longest.\*

\* Editor's Note: One of the reviewers points out that "leprosy per 100 person-years" in Table 7 is incidence. If the incidence of leprosy among persons 15 years of age or older in the area of the institution is 0.13% per year or 0.13 per 100 person-years, then those individuals at the institution for zero to five and six to ten years experience leprosy incidence of 0.15% and 0.18%, comparable to that of the population in the area. The reviewer points out that these newly discovered cases could well have been incubating leprosy at the time of their initial medical examination.—RCH

TABLE 2. *Distribution of students by type of training.*

Students/ type of training	Male	Female	Total
Medical	183	130	313
Nursing	5	302	307
Paramedical	91	66	157
Total	279	498	777

TABLE 3. *Distribution of staff and students by state.*

Geographical state	Staff	Students	Total
Tamil Nadu	2249	352	2601
Andhra Pradesh	106	48	154
Kerala	209	180	389
Karnataka	35	36	71
Other states and areas	66	161	227
Total	2665	777	3442

Among students there were five cases (0.6%) and among staff 19 (0.7%). Attack rates among students by type of training are shown in Table 8. No significant differences were seen. The rates among different categories of staff are given in Table 9. There were no cases among doctors. Attack rates among nurses, housekeeping personnel, and others were 0.97%, 0.81%, and 0.69% respectively. Considering the medical staff and medical students together, the incidence rate was 0.3%. The rate among student and staff nurses combined was 0.8%.

Among the 987 housekeeping staff, 644 work in the wards and are thus directly involved with patient care. Among these, the attack rate was 0.9%. Among the remaining 343, the rate was 0.6%. The difference was not statistically significant.

Based on educational status, the attack rate was 0.8% among those who have minimal or no schooling compared to 0.7% among others.

## DISCUSSION

The attack rates computed in the present study are based on accumulated "new" cases of leprosy from the date of employment at the Christian Medical College and Hospital or admission as students, less the

TABLE 4. *Distribution of staff and students by duration of stay in the institution.*

Duration of stay	Staff	Students	Total
5 years or fewer	892	722	1614
6-10 years	769	55	824
More than 10 years	1004	—	1004
Total	2665	777	3442

TABLE 5. Attack rates (%) by age.

Age group (years)	Male		Female		Total	
	No. obs. <sup>a</sup>	%	No. obs. <sup>a</sup>	%	No. obs. <sup>a</sup>	%
15-19	34	0.0	160	0.0	194	0.0
20-29	631	0.5	863	1.0	1494	0.8
30-39	639	0.6	297	0.3	936	0.5
40-49	405	0.9	155	0.0	560	0.7
50 and over	179	1.7	79	0.0	258	1.2
Total	1888	0.7	1554	0.6	3442	0.7

<sup>a</sup> Numbers of individuals observed.

cases who have selfhealed without sequelae, died, or left in the interval. It is not easy to find any satisfactory basis for comparison of these attack rates with any general population figures since the conventional measures of incidence and prevalence are not defined in a similar manner in a finite institution-related population. It is perhaps more appropriate to compare the attack rates at the institution with the incidence rates rather than prevalence rates in the general population. Nevertheless, since we are dealing with accumulated new cases, which could be considered equivalent to cross-sectional prevalence figures, some comparisons are also provided with the existing prevalence rates in the population around this hospital.

The total attack rate of 0.7% is only  $\frac{1}{5}$  of the prevalence among adults in the general population.\* Compared to the preva-

\* Editor's Note: One of the reviewers points out that crude prevalence at any age includes cases whose leprosy was diagnosed at earlier ages. These cases are excluded from the population of the institution who are being observed in this instance because of the pre-admission or pre-employment medical screening. This reviewer feels therefore that caution must be exercised in comparing the present institutional attack rates with population prevalence data.—RCH

lence rates among adult males and adult females, which are 4.0% and 2.5% respectively (<sup>11</sup>), the attack rates within the institution are significantly less. The incidence rate per year among adults in the general population is 0.13%; for men and women, the rates are 0.14% and 0.11% respectively (<sup>10</sup>). Compared to these also, the attack rates in this study are significantly lower. Thus, by both criteria, the attack rates in the institution are found significantly low.

Several factors may be responsible for this low attack rate. Earlier age at exposure, poor socio-economic background, low educational status, etc., have been shown to be associated with higher prevalence rates (<sup>1, 2, 4, 5, 6, 7, 8, 10, 12</sup>).

In the present study a vast majority of the persons observed are from Tamil Nadu, and a significant proportion of them were from low socio-economic backgrounds. Despite these features, no trends were observed among the different categories of staff and students. Thus the low incidence will have to be explained on other grounds.

Although exposed to leprosy, prolonged or intimate contact does not exist in a hospital environment.

TABLE 6. Attack rates (%) by geographical state.

Geographical state	Male		Female		Total	
	No. obs. <sup>a</sup>	%	No. obs. <sup>a</sup>	%	No. obs. <sup>a</sup>	%
Tamil Nadu	1549	0.8	1052	0.7	2601	0.8
Andhra Pradesh	75	0.0	79	1.3	154	0.6
Kerala	106	0.0	283	0.7	389	0.5
Karnataka	38	0.0	33	0.0	71	0.0
Others	120	0.8	107	0.0	227	0.4
Total	1888	0.7	1554	0.6	3442	0.7

<sup>a</sup> Number of individuals observed.

TABLE 7. Attack and incidence rates (%) by duration of stay in the institution.

Service (years)	Number observed	Estimated person-years of observation	Leprosy		
			No.	Per 100 persons	Per 100 person-years
0-5	1614	4035	6	0.4	0.15
6-10	824	6180	11	1.3	0.18
More than 10	1004	18,072	7	0.7	0.04
Total	3442	28,287	24	0.7	0.08

Age of exposure in our group is 15 years and above. It has been shown by earlier workers that the incidence of leprosy is maximum in the age range of ten to 14 years (\*) with the age of exposure still earlier. Thus the later age of exposure is another possible factor in the low incidence seen in our group.

The mobility of a population under study would influence the prevalence rate. Our institutional population is more dynamic than that of the local area. It is possible that some who may have developed the disease are no longer under observation and hence missed.

Although drawn from varying backgrounds, staff and students in a medical institution all have a reasonable awareness of basic health problems. In general, they tend to unconsciously develop good personal habits and practice better environmental hygiene than a comparable group outside such an institution.

Considering the background of the vast majority of our staff-student community with respect to state of residence, socio-economic status, educational background,

TABLE 8. Attack rates (%) among students by type of training.

Training	Total observed	Leprosy	
		No.	%
Medical	313	2	0.64
Nursing	307	2	0.65
Paramedical	157	1	0.64
Total	777	5	0.64

TABLE 9. Attack rates (%) among staff by category of work.

Staff	Total observed	Leprosy	
		No.	%
Doctors	338	—	0.0
Nurses	523	5	0.96
Housekeeping	987	8	0.81
Others	817	6	0.69
Total	2665	19	0.70

etc., one could suspect that working in an environment with a significant number of leprosy patients would expose them to a greater risk of acquiring the disease. However, the low attack rate of 0.7% on all ages, sexes, social, and educational backgrounds makes us conclude that staff and students who serve leprosy patients in a general hospital for whom no special isolation is practised do not carry any additional risk of acquiring clinical leprosy.

### SUMMARY

The Christian Medical College and Hospital, Vellore, with 1208 beds, is situated in an endemic area in which the prevalence of leprosy among adults is 3.4%. Two percent of the beds are occupied by leprosy patients, and about 4000 are seen as outpatients per year. They share with other patients all medical, nursing, laboratory, and other services. The impact of these attitudes and practices on the incidence of leprosy among staff and students was studied.

This hospital has 2665 staff, including housekeeping personnel, technicians, nurses, and doctors. There are 777 medical, nursing, and paramedical students. Every employee and student is screened prior to entry into this institution and subjected to routine annual examinations. Of those who at initial screening had no evidence of leprosy, 24 acquired the disease. Sixteen had tuberculoid, two borderline, and six indeterminate leprosy. The attack rate of 0.7% is significantly lower than the incidence or prevalence of leprosy in the area.

Factors contributing to this low attack rate are discussed with particular reference to age, sex, educational background, residential status, and area of work. It is sug-

gested that staff and students serving leprosy patients for whom no isolation is practiced do not carry any additional risk of acquiring clinical leprosy.

### RESUMEN

El Hospital y Colegio Médico Cristiano, Vellore, con 1208 camas, está situado en un área endémica en la cual la prevalencia de lepra entre los adultos es del 3.4%. Dos por ciento de las camas están ocupadas por pacientes con lepra en tanto que aproximadamente 4000 pacientes se atienden por año en consulta externa. Los pacientes con lepra comparten con otros pacientes todos los servicios médicos, la enfermería, el laboratorio, y otros servicios. Se estudió el impacto de estas situaciones en la incidencia de lepra entre el personal y los estudiantes de la institución.

El Hospital tiene un personal de 2665 trabajadores, incluyendo a empleados de limpieza y mantenimiento, técnicos, enfermeras y doctores. Hay 777 estudiantes de medicina, enfermería y paramédicos. Cada empleado y estudiante es investigado antes de su entrada a la institución y sujeto a exámenes anuales. De aquellos que en la investigación inicial no tuvieron evidencias de lepra, 24 adquirieron la enfermedad. Dieciséis tuvieron lepra tuberculoide, dos lepra intermedia y seis lepra indeterminada. El grado de ataque del 0.7% es significativamente más bajo que la prevalencia de la lepra en el área. Los factores que contribuyen a este bajo grado de ataque se discuten con referencia particular a edad, sexo, nivel de educación, estado residencial, y área de trabajo. Se sugiere que el personal y los estudiantes que atienden a los pacientes con lepra (para quienes no se practica la política de aislamiento) no se encuentran ante un riesgo adicional de adquirir la enfermedad.

### RÉSUMÉ

Le Christian Medical College et l'Hôpital de Vellore, avec 1208 lits, est situé dans une région endémique dans laquelle le taux de prévalence de la lèpre parmi les adultes atteint 3,4%. Deux pour cent des lits sont occupés par des malades de la lèpre: environ 4000 malades sont vus à la polyclinique, comme malades ambulatoires, chaque année. Ces malades partagent avec les autres malades tous les services médicaux, de nursing, de laboratoire, etc. On a étudié l'influence de ces attitudes et de ces pratiques sur l'incidence de la lèpre parmi le personnel et les étudiants.

L'hôpital a un personnel s'élevant à 2665 personnes, y compris le personnel d'entretien, les techniciens, les infirmières et les médecins. Le nombre d'étudiants en médecine, en nursing, et en études paramédicales s'élève à 777. Chaque employé, de même que chaque étudiant, est examiné avant son admission en institution, et de plus est soumis à des examens annuels de routine, parmi ceux qui ne présentaient pas de signe de lèpre lors de l'examen initial, 24 ont contracté la maladie. Seize ont développé une lèpre tuberculoide,

deux une lèpre border-line, et six une lèpre indéterminée. Le taux d'attaque de 0,7% est significativement plus faible que l'incidence ou la prévalence de la lèpre dans la région.

Les facteurs qui contribuent à ce taux d'attaque peu élevé sont discutés, en particulier en ce qui concerne l'âge, le sexe, le niveau d'éducation, l'endroit de résidence, et l'endroit du travail. On suggère que le personnel et les étudiants qui s'occupent de malades de la lèpre pour lequel aucun isolement n'est pratiqué, ne sont soumis à aucun risque additionnel de contracter la maladie.

### REFERENCES

1. COCHRANE, R. G. *A Practical Textbook of Leprosy*. London: Oxford University Press, 1947, pp. 1, 11, 13, 16, 21.
2. DHARMENDRA. The present distribution of leprosy. In: *Leprosy*. Vol. I. Bombay: Kothari Medical Publishing House, 1978, p. 16.
3. DHARMENDRA. The present distribution of leprosy. In: *Leprosy*. Vol. I. Bombay: Kothari Medical Publishing House, 1978, p. 25.
4. DOULL, J. A. Salient features in the epidemiology of leprosy. Symposium Series, Am. Assoc. for Advance. Sci., Vol. 1, 1938, quoted by L. F. Badger. In: *Leprosy in Theory and Practice*. 2nd ed. Cochrane, R. G. and Davey, T. F., eds. Bristol: John Wright & Sons Ltd., 1964, p. 77.
5. JOB, C. K., SELVAPANDIAN, A. J. and KURIAN, P. V. *Leprosy—Diagnosis and Management*. 2nd ed. New Delhi: Hind Kusht Nivaran Sangh, 1975, p. 8.
6. MUIR, E. *Manual of Leprosy*. London: E. S. Livingstone, 1948, pp. 12, 15, 16.
7. NOORDEEN, S. K. Epidemiology. In: *Textbook of Leprosy for Students and Paramedical Workers*. Thangaraj, R. H., ed. London: The Leprosy Mission, 1975, p. 8.
8. NOUSSITOU, F. M., SANSARRICQ, H. and WALTER, J. Epidemiology. In: *Leprosy in Children*. Geneva: World Health Organization, 1976, pp. 11–12.
9. NOUSSITOU, F. M., SANSARRICQ, H. and WALTER, J. Psychosocial aspects. In: *Leprosy in Children*. Geneva: World Health Organization, 1976, p. 25.
10. RAO, P. S. S., KARAT, A. B. A., KALIAPERUMAL, V. G. and KARAT, S. Incidence of leprosy in Gudiyatham Taluk, South India. *Indian J. Med. Res.* **60** (1972) 97–105.
11. RAO, P. S. S., KARAT, A. B. A., KALIAPERUMAL, V. G. and KARAT, S. Prevalence of leprosy in Gudiyatham Taluk, South India. Part I. Specific rates with reference to age, sex and type. *Int. J. Lepr.* **40** (1972) 157–163.
12. ROGERS, L. and MUIR, E. *Leprosy*, 3rd ed., 1946, pp. 73, 165, 207, quoted by L. F. Badger. In: *Leprosy in Theory and Practice*. 2nd ed. Cochrane, R. G. and Davey, T. F., eds. Bristol: John Wright & Sons, 1964, p. 76.