

## LEPROSY IN THE RURAL AREAS OF KANPUR DISTRICT

ITS RELATIONSHIP WITH THE TUBERCULIN POSITIVITY RATES  
IN THE LOCAL POPULATION

V. K. SHARMA, M.B., B.S., D.P.H.

*District Medical Officer of Health  
Kanpur, Uttar Pradesh, India*

The Kanpur district of the State of Uttar Pradesh, irregularly quadrilateral in shape, belongs to the tract known as the lower "Doab" (Land Between Two Rivers) lying between the Ganges and the Jamuna Rivers and extending over some 2,360 square miles. Like the rest of the Doab, it consists mostly of alluvial plain. It is divided into six administrative subdivisions. The population of the rural area of the district is over 12,000,000.

The District Headquarters, Kanpur, is the largest city of Uttar Pradesh and its industrial capital, with a population of over 7,000,000. The city is believed to have the unfortunate distinction of probably possessing the highest tuberculosis morbidity among the towns of the world.

The study which is the subject matter of this communication was carried out by me in 1957-1958. A preliminary survey for "obvious" leprosy cases was made through the village-level staff of the Development and Panchayat Departments, after they were trained in the rudiments of leprosy. The returns of this survey are given in Table 1.

TABLE 1.—Prevalence of "obvious" leprosy cases per 10,000 population, and percentages of tuberculin positivity in children aged 0-14 years, in the subdivisions of Kanpur District

Subdivision	Leprosy case rate	Tuberculin positivity <sup>a</sup>
Ghatampur	9.00	31.8%
Akbarpur	7.82	29.4%
Bhognipur	7.15	33.8%
Kanpur (Rural area)	7.28	36.4%
Derapur	5.22	35.6%
Bilhaur	2.11	39.4%
Kanpur City	Not known	68.1%

<sup>a</sup> The data on tuberculin positivity are based on the figures of the BCG vaccination campaign, 1952-1954.

These figures are not to be taken as even a rough index of the prevalence of the disease. They were collected only to get, if possible, a comparative idea of its prevalence in the different subdivisions. Incidentally, this survey helped in making the people leprosy conscious.

After the preliminary survey was over, there were selected for the leprosy survey the Ghatampur and Bhognipur subdivisions from among those with the highest rates, and the Bilhaur subdivision with the lowest rate. The survey was made by me in the villages of these subdivisions from which the highest leprosy figures had been reported by the preliminary survey. The data collected have been compiled in Tables 2 and 3.

TABLE 2.—*Leprosy cases found in the three subdivisions of Kanpur district surveyed.*

Subdivision	No. of villages surveyed	Population, villages surveyed	No. of people examined	Leprosy cases detected <sup>a</sup>			
				Lepromatous	Nonlepromatous	N/L	Total
Ghatampur	7	8,997	1,203	13	52	5	70
Bhognipur	5	5,582	1,986	10	44	5	59
Bilhaur	6	6,061	2,145	4	22	3	29
Total	18	20,640	5,334	27	118	13	158

<sup>a</sup> The cases found were classified according to Dharmendra's review at the 1955 meeting of the Indian Association of Leprologists (3).

TABLE 3.—*Break-down of the 158 leprosy cases found according to age and sex.*

Subdivision	0-14 years		15 years and over		Total	
	Male	Female	Male	Female	Male	Female
Ghatampur	1	1	57	11	58 (83%)	12 (17%)
Bhognipur	4	1	45	9	49 (83%)	10 (17%)
Bilhaur	—	—	25	4	25 (86%)	4 (14%)
Total	5	2	127	24	132 (84%)	26 (16%)

The data pertaining to tuberculin positivity in the places of this leprosy survey may now be considered. No fresh work was undertaken for its assessment at this stage. Tuberculin testing in the rural areas of Kanpur District was undertaken for the first time during the BCG

campaign of the State Health Department in 1952-1954. The figures on tuberculin positivity obtained during that campaign have been compiled in Table 4.

TABLE 4.—*Results of tuberculin testing in Kanpur District, by age.*

Subdivision	0-14 years		15 years and over	
	Tested	Positive	Tested	Positive
Ghatampur	16,895	5,387 (31.8%)	16,831	13,847 (82.2%)
Bhognipur	12,807	4,336 (33.8%)	13,498	11,642 (86.2%)
Bilhaar	14,106	5,570 (39.4%)	14,878	1,052 (87.7%)
Kanpur City	45,755	31,603 (68.0%)	26,847	23,948 (89.2%)

Considering the very high tuberculin positivity rates, especially in the older age group, it may be noted that the International Tuberculosis Campaign (1948-1951) tested over 100,000 persons in five cities in India (one of them in Uttar Pradesh) and got about 75 per cent positives in the 15-year range. There has been no BCG vaccination to affect the data of Table 4, and the effects of low-grade (nonspecific) reactivity are supposed to have been minimized by fixing a high "positivity threshold" to a low dose of tuberculin. The dose for the Mantoux test was 5 TU, and to be regarded as positive the reaction had to be 6 mm. in diameter instead of the usual 5 mm.

Because "the pattern of natural allergy [had] not been distorted by BCG-induced allergy" prior to the tuberculin testing, because bovine infection is uncommon and without significant influence on the epidemiology of tuberculosis in India, and because the effects of low-grade, nonspecific sensitivity were minimized, the significance of the reactivity data must be deemed to be considerable. The very high tuberculosis disease rate of Kanpur City may be one of the factors responsible for the high tuberculin sensitivity rates in the neighboring rural areas.

#### DISCUSSION

The objects of this study were, first, to obtain the leprosy picture of Kanpur district, and, second, to ascertain if there was any difference in the frequency of tuberculin positivity among the population of the areas of high and low prevalence of leprosy.

*Leprosy picture of Kanpur district.*—In the 18 villages surveyed, whose total population was 20,640, 158 cases of leprosy were detected among the 5,334 people examined. The prevalence of the disease was highest in the Ghatampur and Bhognipur subdivisions, as had been

indicated by the preliminary survey. In the 12 villages of these two subdivisions that were surveyed, 129 cases were found among the 3,189 people examined, i.e., 40.5 per thousand (or slightly less than 1 per hundred of the total population). The lepromatous cases in these two subdivisions constitute about one-fifth (18%) of the total.

In the Bilhaur subdivision, however, the picture is quite different. There, among the 2,145 people of six villages who were examined, only 29 cases were found, or 13.5 per thousand (slightly under 0.5 per hundred of the total population of 6,061). When projecting these data over the district it will, however, have to be remembered that most of the surveyed villages were those in which high prevalence of the disease had been anticipated.

The prevalence of leprosy among the children was very low, and this would indicate that the disease is on the wane. In the villages, however, the impression was gained that the number of cases is on the increase. The sex distribution of the cases found indicates that the women have the relatively low ratio of about one-fifth of the male cases. This, however, does not appear to be the true picture; it has probably resulted from lesser numbers of women turning up for examination.

The highest leprosy rate was found in the Sithra Khurd village of the Bhognipur subdivision, where 24 cases were found among 296 people examined, or 8.1 per cent; the total population of the village is 346.

Another feature to be remarked upon is that among the initial cases in almost all of the severely affected villages there were members of influential and prominent families. In one village the disease has been present in the most influential family of the locality for many generations. The presence of the disease in an influential family may favor its spread, as such persons are not shunned by the people because of their influence, and there is intimate familial and extrafamilial contact especially with the relatives and domestic servants, whose numbers are always considerable.

*Tuberculin positivity in relation to leprosy morbidity.*—In 1939 Fernandez (<sup>6</sup>), for the first time, suggested the possible value of inoculation with BCG of the lepromin-negative contacts of leprosy patients. Since then the question of cross immunity or “premunition” pertaining to these two infections has been a live issue. Chaussinand (<sup>1</sup>) believes that leprosy is driven out of a herd when the herd is invaded by tuberculosis. He attributes this phenomenon to a protection against leprosy conferred by tuberculosis.

Many authoritative articles upholding similar views can be cited. Fernandez (<sup>7</sup>) mentions, “. . . antagonism between tuberculosis and leprosy in the sense that the former renders the system more resistant to the latter.” De Souza Campos (<sup>12</sup>) believes that it is the primary in-

fection with tuberculosis which causes lepromin positivity in those persons who exhibit such positivity without contact with leprosy patients. The works of Dharmendra and Jaikaria (4) and Hale *et al.* (5) have also to be mentioned while discussing this issue.

This matter has been considered with admirable thoroughness by Lowe and his colleagues (6, 10). Some of the evidence adduced by them supports the theory, while the rest goes against the hypothesis on which it is based. Their position, in brief, is that there is considerable evidence in support of there being a tuberculosis protection against leprosy, but that this evidence cannot be called conclusive.

Like the theory of cross immunity, the question of the value of BCG vaccination in the prophylaxis of leprosy also awaits a conclusive answer. This is why many leprosy workers, among whom may be mentioned Lowe and McNulty (9), Mukherjee (13), and Dharmendra (2, 5), advocate the use of BCG vaccination as an antileprosy measure but with reservations. The position and the history of the work on this subject has been reviewed by Wade (12), who speaks of the "Great Expectations" associated with BCG vaccination. If it is proved that BCG vaccination can immunize the leprosy contact, particularly those who come from the group of young children of leprosy patients, these expectations will remain an illusion no more.

It was in the context of what has just been reviewed that the present study to assess the difference, if any, between the incidence of tuberculin positivity of the populations of the areas with varying leprosy incidence was undertaken. Chaussinand anticipates that the tuberculin rate should be low in regions where leprosy has recently spread, and high in the regions from which it has disappeared.

The areas selected in the Kanpur district, viz., Ghatampur and Bhognipur subdivisions with high leprosy prevalence on the one hand, and Bilhaur subdivision with a relatively low prevalence on the other hand, were chosen because of the contrast in that respect. These are rural areas with almost matching conditions, in which the disease has been present for quite a long time. The discrepancy that is bound to enter when rural and urban areas, or advanced and backward countries, differing in innumerable ways are compared with respect to these two factors, is not expected to vitiate the findings of this study.

Considering now the data of Table 4, the percentage of tuberculin positivity in the older age group (fifteen years and above) does not show any appreciable difference between one rural area and the other. Even between the city and village populations this difference is not marked.

With respect to the younger age group (0-14 years), however, the tuberculin positivity rates of the urban and the rural areas vary widely. Among the rural areas of various subdivisions this variance, although of a low order, is significant. The tuberculin positivity for this age

group is 31.8 per cent for Ghatampur, as compared to 39.4 per cent for the Bilhaur subdivision. In these two subdivisions the higher incidence of leprosy in the population goes with the lower incidence of tuberculin positivity in the lower age group. The consideration of this age group is all the more significant in view of the fact that it is particularly vulnerable to leprosy infection. It may, however, be pointed out that between the Bhognipur and Bilhaur subdivisions, although there is considerable variance in the prevalence of leprosy, the difference in the tuberculin rates in the younger age group is not so marked, being only a little above 5 per cent. In any case, here too the higher leprosy incidence goes with a lower tuberculin positivity rate in the age group in question.

In conclusion it may be said that, from the results of this limited study, it cannot be conclusively contended that higher incidence of tuberculosis infection in the 0-14-years age group in a herd necessarily goes with a lower prevalence of leprosy in the herd as a whole, although the results point in that direction. A similar study over vaster areas should be more fruitful.

#### SUMMARY

A study has been made of the leprosy situation in the Kanpur District of Uttar Pradesh. In 18 villages with over 20,000 total population, 5,334 people were examined and 158 leprosy cases were detected of which 27 were of the lepromatous type. The prevalence of the disease in children proved to be low, although the number of cases in the population on the whole is on the increase.

The question of cross immunity between tuberculosis and leprosy, with its bearing on the role of BCG in leprosy prophylaxis, has been discussed. The frequency of tuberculin positivity in the populations of the areas with comparatively high and low incidence of leprosy has been studied. Although the findings are not conclusive, it was found that the prevalence of leprosy in the population was related inversely to the frequency of tuberculin positivity in the 0-14 years age group.

#### RESUMEN

Analiza este estudio la situación de la lepra en el Distrito de Kanpur en Uttar Pradesh. En 18 aldeas con una población total de más 20,000 personas, se examinó a 5,334 sujetos, descubriéndose 158 casos de lepra, 27 de los cuales eran de forma lepromatosa. La frecuencia de la enfermedad en los niños resultó baja, aunque el número de casos en la población en conjunto va en aumento.

Se discute la cuestión de la inmunidad cruzada entre la tuberculosis y la lepra, con su relación sobre el papel del BCG en la profilaxis de la lepra. Se estudia la frecuencia de la positividad a la tuberculina en las poblaciones de las zonas que muestran una incidencia comparativamente alta o baja de lepra. Aunque los hallazgos no son terminantes, se observó que la frecuencia de la lepra en la población guardaba razón inversa a la frecuencia de la positividad a la tuberculina en el grupo de 0-14 años de edad.

## ACKNOWLEDGMENTS

The Antrim Zila Parishad Kanpur provided the funds for this work. The Sanitary and Vaccination staff of the parishad and the village-level staff of the Planning Department helped in the work, and this is gratefully acknowledged. The author is grateful to Dr .S. M. H. Naqvi, Assistant Director (Planning & B.C.G.), Uttar Pradesh, and Dr. M. L. Mehrotra, B.C.G. Officer, for providing the tuberculin testing data.

## REFERENCES

1. CHAUSSINAND, R. Tuberculosis and leprosy; mutually antagonistic diseases. *Leprosy Rev.* **24** (1953) 90-94 (translation by J. Lowe of pp. 146-152 of "La Lèpre" (1950).
2. DHARMENDRA. The possible role of BCG vaccination in prophylaxis against leprosy. *Lep. India* **24** (1952) 1-3 (editorial).
3. DHARMENDRA. Classification of leprosy. *Lep. India* **27** (1955) 93 (abstract).
4. DHARMENDRA and JAİKARIA, S. S. Studies of the lepromin test. (2) Results of the test in healthy persons in endemic and non-endemic areas. *Lep. India* **13** (1941) 40-47.
5. DHARMENDRA, MAZUMDER, S. and MUKHERJEE, N. The possible role of BCG vaccination in prophylaxis against leprosy. *Lep. India* **25** (1953) 163-168.
6. FERNANDEZ, J. M. M. Estudio comparativo de la reacción de Mitsuda con las reacciones tuberculínicas. *Rev. Argentina Dermatosisif.* **23** (1939) 425-453.
7. FERNANDEZ, J. M. M. Leprosy and tuberculosis; antagonistic diseases. *A.M.A. Arch. Dermat.* **75** (1957) 101-106.
8. HALE, J. H., MOLESWORTH, B. D., GROVE-WHITE, R. J., SAMBAMURTHI, C. M. and RUSSELL, D. A. The relationship and significance of the Mantoux and lepromin reactions in leprosy. *Internat. J. Leprosy* **23** (1955) 139-147.
9. LOWE, J. and McNULTY, F. Tuberculosis and leprosy; immunological studies. *Leprosy Rev.* **24** (1953) 61-90.
10. LOWE, J. and MCFADZEAN, J. A. Tuberculosis and leprosy; further immunological studies. *Leprosy Rev.* **27** (1956) 140-147.
11. MUKHERJEE, N. B.C.G. vaccination in the control of leprosy. *Lep. India* **27** (1955) 144-148.
12. DE SOUZA CAMPOS, N. BCG in the prophylaxis of leprosy. A preliminary report. *Internat. J. Leprosy* **21** (1953) 307-312.
13. WADE, H. W. The beginnings with BCG in leprosy work. *Internat. J. Leprosy* **24** (1956) 191-194 (editorial).