

of treatment of Indian kala-azar with sodium antimony gluconate work out as follows:—

Type of case	Total number	Cures	Relapses
Early	22	16	6
Well developed	66	62	4

It will be seen that in the early cases the relapse rate is of the order of 27 per cent ( $27.3 \pm 2 \times 9.4$  per cent approximately) and in the well-developed cases it is about 6 per cent ( $6.01 \pm 2 \times 2.9$  per cent approximately).

No strictly comparable data about the treatment of equally early cases of kala-azar with the older pentavalent antimonials are available at present. Napier (1932) however maintained that the early cases do not respond so well to treatment as the fully developed ones, and he presented evidence suggesting that relapses were more frequent in the early cases that were treated with one of the best of the pentavalent antimonials, *viz.* neostibosan.

As for the relapse rate after the treatment of well-developed cases of kala-azar with neostibosan, Napier (*loc. cit.*) found it to be 5.10 per cent. This is practically of the same order as what has been obtained with sodium antimony gluconate in the treatment of this type of cases (6 per cent).

#### Conclusions

On consideration of all the available data regarding the treatment of Indian kala-azar with sodium antimony gluconate it will be evident that the drug possesses considerable anti-kala-azar activity. The immediate clinical cure is obtained in approximately 96 per cent of cases of kala-azar. In about 4 per cent of cases the patient may fail to respond to treatment.

It is important to stress that the total dosage should on an average be 200 c.cm. of the solution containing 20 mg. of Sb. per c.cm. of solution for an adult, 150 c.cm. for a child, and about 75 to 100 c.cm. for an infant, in one course of injections given preferably on consecutive days, intramuscularly or intravenously.

On a study of the relapses, it has been found that the relapse rate is quite high, being of the order of about 27 per cent in the early cases of kala-azar treated with this drug. But as the final results of treatment of this type of equally early cases with the older pentavalent antimonials are not available at present, it is not possible to compare the results.

In the group of cases that has been classified as well developed, *i.e.* of duration more than 3 months and with a positive aldehyde reaction, the relapse rate of the cases treated with this drug is about 6 per cent—a figure which is not very different from what had been obtained with neostibosan in the past by Napier. In this

group of cases the permanent cure rate after subtracting the relapses and the failures is about 91 per cent. This also is not significantly different from the rate obtained with neostibosan by Napier.

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### EPIDEMIOLOGY OF FILARIASIS IN CERTAIN PARTS OF H.E.H. THE NIZAM'S STATE

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THERE is no published record of the incidence of filariasis in Hyderabad State. Preliminary rapid surveys carried out in 1940-42 showed that the disease is endemic in a roughly kidney-shaped area, 4,800-square miles in extent, covering adjacent portions of Nizamabad, Medak, Karimnagar and Adilabad districts.

The endemic zone is situated between latitudes  $18^\circ$  and  $19^\circ$ N. and longitudes  $78^\circ$  and  $79^\circ$ E. The altitude is nearly 1,500 feet. The river Godavery flows through the northern portion and there are a number of irrigation tanks throughout. The climate is hot and humid, the temperature rising in summer to  $112^\circ$ F. and falling in winter to  $74^\circ$ F. The average rainfall is 35 inches. The area is indicated in the map.

The disease has also been recorded sporadically in other parts in the eastern half of the State.

The present study was undertaken in 24 villages within a radius of 15 miles round Kamareddy town in the adjacent portions of Kamareddy and Sirsilla taluqs covering a population of 43,593. This area is shown heavily shaded within the endemic zone in the map. The study was primarily undertaken with a view to devising control measures against the disease.

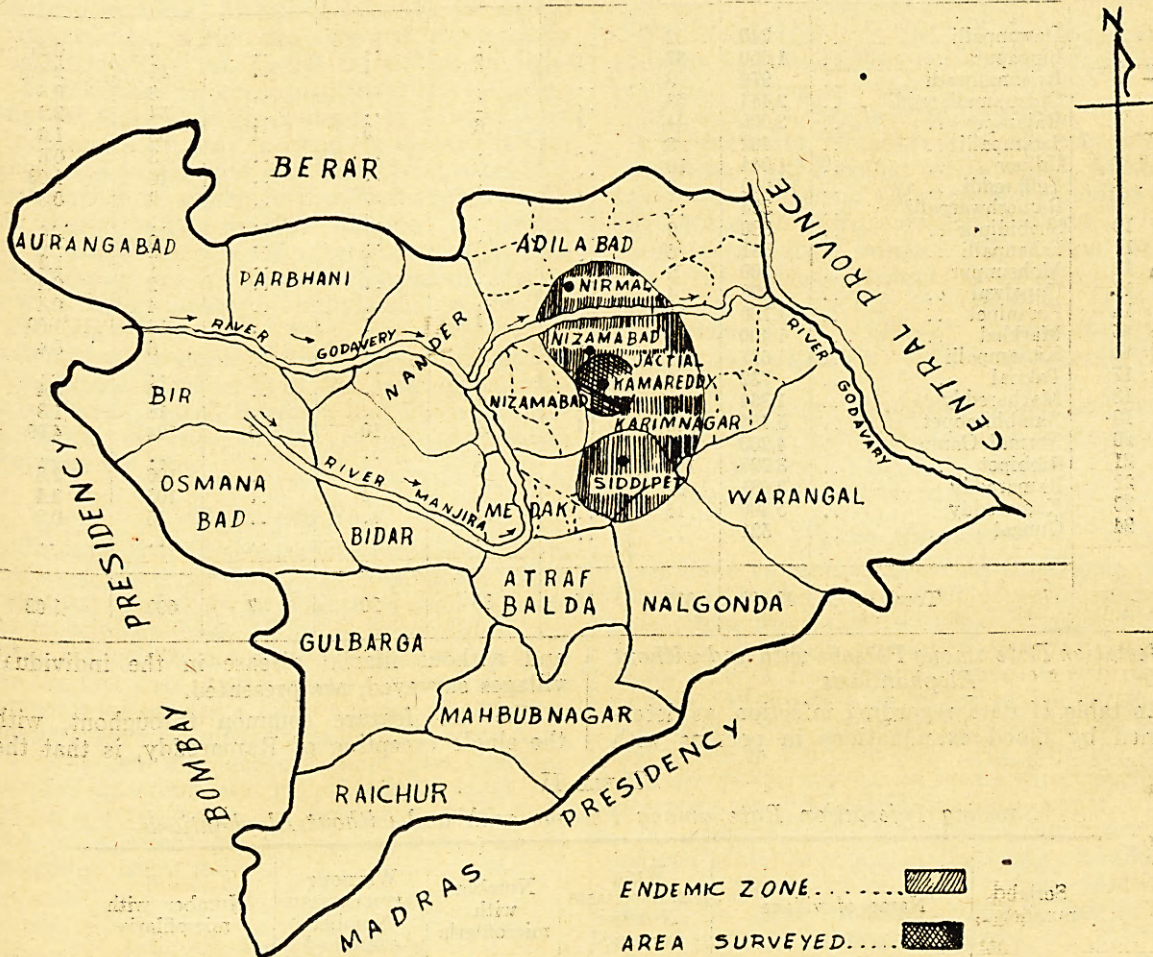
#### Methods of Investigation

In order to determine the incidence of filarial disease and filarial infestation in a village, a house-to-house search was made of persons showing signs of lymphatic obstruction including lymphangitis. Thick smears of finger blood, approximately measuring 20 c.mm., were taken between 9 p.m. and 3 a.m. from diseased as well as healthy persons selected at random.



MAP

MAP OF NIZAM'S STATE SHOWING FILARIAL ENDEMIC ZONE



The total number of smears examined was 722 (see table II).

*Filarial Disease Rate. Sex and Age Incidence*

The result of the disease survey in the area is shown in table I. Sites affected and ages of patients were also noted.

Of the 692 cases recorded, elephantiasis of the leg accounts for 615 (88 per cent), of hand alone for 15 (2.16 per cent), of hand and leg for 35 (5 per cent), of scrotum alone for 20 (2.85 per cent), and scrotum and leg for 7 (1 per cent) cases. The highest disease rate of 4.9 per cent is in Gambhiraopet and the lowest 0.2 per cent in Kamareddy town where comparatively better sanitation prevails as it is the headquarters of the taluq. The average disease rate in the area surveyed is 1.6 per cent. There is no marked difference in incidence in either of the two sexes. The disease in the first age group is nil, and the

age group 46 to 50 accounts for the highest incidence, viz, 21.85 per cent. The earliest occurrence of lymphangitis was at the age of 7 in a boy in Ramareddy and that of elephantiasis of the leg in a girl of 8 years in Gambhiraopet.

*Filarial Infestation Rate. Sex and Age Incidence*

Of the 722 persons whose blood was examined for the presence of microfilaria, 545 were males and 177 females. Microfilaria were found in 92 persons giving an average infection rate of 12 per cent.

The first age group in both the sexes does not show any infestation. The seventh group 31 to 35 accounts for the highest infestation of 21.33 per cent. Infestation rate in the males is 13.3 per cent and in the females 10.16 per cent, so that there is no marked difference in the two sexes.



TABLE I

Serial number	Name of village	Population	ELEPHANTIASIS (INFLAMMATORY AND OBSTRUCTIVE)					Disease rate, per cent	
			Leg	Hand	Hand and leg	Scrotum	Scrotum and leg		Total
1	Dawanpalli ..	740	2	..	..	..	..	2	0.27
2	Lingapur ..	1,650	37	1	2	1	..	41	2.4
3	Krishnajiwadi ..	976	3	..	..	..	..	3	0.3
4	Chinnamallareddi ..	2,444	53	..	1	..	..	54	2.2
5	Rajampet ..	3,000	44	4	6	3	1	58	1.9
6	Sarampalli ..	462	3	..	..	..	..	3	0.6
7	Udloor ..	1,044	10	..	..	..	..	10	1.03
8	Yellareddi ..	2,909	8	..	1	..	..	9	0.3
9	Rameshwarpalli ..	354	..	..	..	..	..	..	..
10	Shabidipur ..	380	9	..	..	..	..	9	2.3
11	Eshanpalli ..	531	6	..	..	1	..	7	1.3
12	Mohsimpur ..	500	2	..	..	..	..	2	0.4
13	Uppalwai ..	998	4	..	..	..	..	4	0.4
14	Posanipet ..	1,190	11	..	1	1	..	13	1.09
15	Markhal ..	1,400	6	..	..	..	..	6	0.4
16	Kiasampalli ..	627	..	..	..	..	..	..	..
17	Takrial ..	732	3	..	..	..	..	3	0.4
18	Machareddy ..	1,361	16	1	1	..	..	18	1.3
19	Gambhiraopet ..	5,456	183	4	21	10	6	224	4.09
20	Nermal Camp ..	4,200	..	..	..	..	..	..	..
21	Bibbipet ..	3,727	101	3	2	..	..	106	2.8
22	Ramareddy ..	3,081	99	2	..	4	..	105	3.4
23	Kamareddy ..	5,300	15	..	..	..	..	15	0.2
24	Gungal ..	521	..	..	..	..	..	..	..
TOTAL ..		43,593	615	15	35	20	7	692	1.62

*Infestation Rate among Persons with and without Elephantiasis*

In table II data regarding infection, as determined by blood examinations in persons with

and without filarial disease in the individual villages surveyed, are presented.

The one feature common throughout, with the single exception of Ramareddy, is that the

TABLE II

*Showing Infestation Rate among Persons with and without Elephantiasis*

Serial number	Name of village	WITH ELEPHANTIASIS Number examined	Number with microfilaria	WITHOUT ELEPHANTIASIS Number examined	Number with microfilaria
1	Devapalli ..	..	..	25	3 (12.0%)
2	Lingapur ..	23	..	7	1 (14.2%)
3	Krishnajiwadi ..	3	..	2	1 (50.0%)
4	Ghinnamallareddi ..	15	..	15	..
5	Rajampet ..	8	..	7	2 (28.5%)
6	Udloor ..	8	..	4	..
7	Yellareddy ..	5	..	7	..
8	Shabidipur ..	7	..	18	2 (11.1%)
9	Eshanpalli ..	2	..	22	4 (18.1%)
10	Mohsimpur ..	2	..	23	2 (8.7%)
11	Uppalwai ..	2	..	23	3 (13.0%)
12	Rameshwarpalli ..	..	..	10	1 (10.0%)
13	Posanipet ..	2	..	1	1 (100.0%)
14	Markhal ..	6	..	17	3 (17.6%)
15	Kasimpalli ..	..	..	26	2 (7.6%)
16	Takrial ..	3	..	22	2 (9.0%)
17	Machareddy ..	7	..	68	14 (20.6%)
18	Gambhiraopet ..	14	..	93	19 (20.4%)
19	Bibbipet ..	7	..	47	10 (21.2%)
20	Ramareddy ..	22	1 (4.5%)	56	5 (8.9%)
21	Kamareddy ..	2	..	66	10 (15.1%)
22	Nermal Camp ..	..	..	25	6 (24.0%)
TOTAL ..		138	1 (4.5%)	584	91 (15.5%)



infection rate in persons with apparent signs of filarial disease is zero; whereas high infestation rates are obtained in apparently healthy persons, the average rate being 15.5 per cent. The observations recorded by Iyengar (1938) in Travancore and Brown (1945) in U.S.A., in contrast to those of other observers in several parts of the world, also showed a markedly higher incidence of filarial infestation in individuals with no apparent manifestations of disease than in those showing evidence of disease. Our findings are not only in complete agreement with those of Iyengar (*loc. cit.*) and Brown (*loc. cit.*) but have gone a step further in that practically no filarial infestation was obtained in persons with filarial disease. On account of this contrast in the incidence of filarial infestation and filarial disease in individuals, doubt has been thrown on the very basic theory of helminthic causation of the disease, although the remarkable coincidence of the geographical distribution of filarial infection and filarial disease furnishes evidence of the causal relationship between the two.

#### Endemicity Rate

In order that the endemicity rates obtained in different parts of India be comparable, it is necessary that their determination shall be made on a common basis. This is important in the case of filariasis as we have to base our findings on the fact that in addition to the cases showing evidence of disease a large number of asymptomatic cases with microfilaria in their blood have to be taken into account, and cases showing disease symptoms and microfilaria in blood not being counted twice. A tentative formula for the calculation of the endemicity rate is suggested below:—

$$E = \frac{d + \frac{i}{h}(p-d)}{p} \times 100$$

where 'E' is the endemicity rate expressed as a percentage of 'p' the population surveyed; 'd' is the number of persons showing signs of disease; 'i' the number of persons with microfilaria in the blood and 'h' the number of apparently healthy persons examined.

Calculated on the basis of the above formula the endemicity rate in the villages surveyed varied between 27.5 and 50 per cent with an average endemicity rate of 17.15 per cent for the whole area.

#### Average Infestation

This term denotes the average number of microfilaria per positive blood film, only one sample being taken from each person. The quantity of blood drawn was not actually measured but blood drops of uniform size approximating 20 c.mm. were taken as far as possible. The highest infestation recorded was 447 and the average rate for the area was 27.

#### Types of Filarial Infestation

The predominant infestation is *Microfilaria bancrofti* (Cobbold) which accounts for 92.4 per cent of the total infestation and *Microfilaria malayi* (Brug) for the remaining 7.6 per cent.

#### Mosquito Fauna

The following is a list of the Megarhine, Culicine and Anopheline mosquitoes caught and identified during the survey.

*Megarhinini*.—*Megarhinus splendens*.

*Culicine*.—(1) *Uranotania* sp. (2) *Aedomyia venustipes*. (3) *Ficalbia* (*Mimomyia*) *chamberlaini*. (4) *Mansonia* (*Mansonioides*) *uniformis*. (5) *Mansonia* (*Mansonioides*) *indiana*. (6) *Ficalbia* (*Ficalbia*) *minima*. (7) *Lutzia fuscanus*. (8) *Lephoceratomyia minutissimus*. (9) *Culex fatigans*. (10) *C. vishnui*. (11) *C. bitaniorhynchus*. (12) *C. tritaniorhynchus*. (13) *C. fuscocephalus*. (14) *C. whitmorei*. (15) *C. mimulus*.

*Anophelini*.—(1) *Anopheles subpictus*. (2) *A. vagus*. (3) *A. culicifacies*. (4) *A. fluviatilis*. (5) *A. annularis*. (6) *A. pallidus*. (7) *A. hyrcanus*. (8) *A. barbirostris*.

#### Vector Mosquito

Of these mosquitoes collected *C. fatigans* was found to be the vector. Out of seven infected mosquitoes three showed shorter sluggish forms of larvæ in which herniation occurred on the slides after a few minutes, while in four mosquitoes full-grown and longer active larvæ of *Wuchereria* were found in the thoracic muscles and a few in the proboscis. The infection rate in *Culex fatigans* seems to bear a direct correlation with the filarial infection rate in man.

No specimens of *Mansonioides uniformis* or *indiana* could be found in the human dwellings even in places where *Mf. malayi* occurred. Search for these continues. Only a few adults were caught in the breeding places.

#### Breeding Places

At the time of the present investigation the *Culex fatigans* was found breeding only in cesspools and disused wells, although in the rainy season ubiquitous breeding places may be found such as collections of water in village-pits with decaying organic matter and ricefields manured with cowdung. The *Mansonioides uniformis* and *indiana* were found breeding in ponds containing *Pistia* at Gambhiraopet and in an old irrigation canal in Bibbipet originating from a big tank rich in aquatic flora including *Pistia* and *Marsillia quadrifolia*.

#### Conclusions

1. Although the filarial disease rate in any of the villages is not high, the endemicity rate in Machareddi, Gambhiraopet, Bibbipet and Nermal Camp are sufficiently high to call for immediate preventive measures. There is another group of a dozen villages with moderate endemicity rate which if neglected may further



deteriorate and might prove a great source of infestation to the surrounding villages.

2. Infestation and disease rates show no predilection for either sex.

3. Earliest incidence of lymphangitis was found to be at the age of 7. The highest incidence of disease is in the age group (46 to 50) and the lowest in the (6 to 10) age group.

4. In agreement with the findings of Iyengar (*loc. cit.*) in Travancore and Brown (*loc. cit.*) in U.S.A. the filarial infestation rate in apparently healthy persons is very much higher than in persons showing clinical signs of disease in whom it is almost nil.

5. The importance of blood examination in determining the incidence of the disease in a given area has been stressed.

6. The predominant filarial infestation in the area surveyed is *Mf. bancrofti* and the vector is *C. fatigans*.

7. Malayi infestation has been detected and *Mansonioides uniformis* and *indiana* were found breeding in ponds and irrigation canals in which *Pistia Marsillia* grow.

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### PLAGUE-MENINGITIS

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THIS is a report on 2 cases of plague-meningitis observed by us among the comparatively small material of 41 instances of plague treated at Wellington, Nilgiris, in 1945-46.

We consider our cases worthy of record as the cerebro-spinal type of plague has been described in very few instances only, the disease being believed to be of extreme rarity.

Lewillon, Devignat and Schoetter (1940) reported in 1940 on plague causing primary meningitis. Unfortunately we have not been able to obtain their paper. Meyer of California, according to Manson-Bahr (1940), described a chronic relapsing meningeal form of plague, in which the patients exhibited meningeal symptoms and high fever. *P. pestis* was isolated in these

cases from the blood. Wu Lien-Teh, Chum, Politzer and Wu (1936) in a detailed review of plague comment with regard to the meningeal form that only rare instances of this kind have been observed. According to these authors one case was seen by Paso in 1925 in a Spaniard and another one by Lafort *et al.* in a native of Dakar. The latter case showed *P. pestis* in the C.S.F.

As far as we can see no such cases have hitherto been described from this country.

#### Case Records

1. A woman, aged 47, from Coonoor, Nilgiris, fell suddenly ill with high pyrexia, malaise and subsequent delirium on 16th April, 1945. She was admitted to hospital where she developed a moderate enlargement of the axillary glands. A gland smear was taken, which on examination at the Pasteur Institute, Coonoor, was negative for *P. pestis*. She was treated with sulphonamides and iodine injections with the result that her condition showed considerable improvement within a couple of days. At the request of her family she was allowed to be taken home after a stay at hospital of less than one week. While at her home she continued to run an irregular temperature. On 6th May, 1945, one of us (Nambiar) was called out to see her as she had again felt very ill for the past 24 hours. At that stage she was found to be delirious and very restless. She vomited and retched incessantly. There was definite nuchal rigidity, and Kernig's sign was positive. The axillary gland had remained stationary without sign of impending suppuration. She was re-admitted to hospital where lumbar puncture was done. Culture of C.S.F. at the Pasteur Institute, Coonoor, showed *P. pestis*. The patient died the following day. She is reported to have been protected with anti-plague vaccine 2 months previously.

2. A girl, aged 7 years, was admitted to hospital on 7th April, 1946, for fever of 2 days' duration. On admission the child was apathetic, listless and markedly dehydrated. Eyes were sunken, not congested; the tongue was dry and coated. Spleen and liver were not palpable. Respiratory and circulatory system showed nothing abnormal. Left axillary glands were moderately enlarged and tender. Temperature 101°F. in axilla, pulse 128; gland smear examined at the Pasteur Institute, Coonoor, was positive for *P. pestis*. The patient was treated with sulphadiazine in full doses and intravenous glucose (25 per cent) 20 c.c. daily and fluids orally in abundance. On the 5th day of her stay at hospital she developed an inguinal bubo. The axillary glands suppurred and had to be incised. After this the patient appeared to be improving and the temperature returned to normal by 16th April. However, on the 21st, her condition became worse with a relapse of