

SERO-REACTIVITY FOR SYPHILIS IN BOMBAY*

BY

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The incidence of syphilis in a community is reflected in the routine hospital work of serodiagnosis, and as no reports of large scale serological surveys of the healthy population in the larger cities of India are available, it is the purpose of this paper to present such data.

In writing about the incidence of syphilis from figures of a hospital registry, one must describe the relationship of that laboratory to the community in respect of attendance, admission, population, area, number of institutions, etc. Further, the figures should refer to reactivity in one single test and be spread over several years to make them comparable. The constancy of staff, the standard of the antigen, and the procedures used are also important. The standard and the techniques used should be checked through a national reference laboratory.

Thus, this paper is a retrospective study of the records of serological tests for syphilis carried out at the Pathology School, Grant Medical College, Bombay, India, from 1950 to 1956. A number of important events have taken place locally in relation to this disease during the period under review and it is proposed to present the data against this background.

General Background

According to the census report of 1951, the population of Bombay and its suburbs is 2,839,270, distributed over an area of 36 square miles. This community is served by nearly twenty large public hospitals, of which the J.J. Group of Hospitals is one of the biggest general hospitals dealing with venereal diseases. The average number of patients attending this hospital is 270,000 in a year, including nearly 9,000 cases seen in the V.D. out-patient department. New patients registered each year

total 135,000, which means that nearly 4 per cent. of Bombay's population attend this teaching hospital.

In 1949, a W.H.O. demonstration team in India, realizing the large-scale work that would have to be undertaken with meagre facilities, thought that the Meinicke rapid test would be the most suitable one for use. They organized training facilities and the free supply of equipment to various centres in India, and this laboratory was approved for this purpose. The test has the advantage that it can be performed rapidly while the patient waits and is extremely inexpensive.

As it uses a non-specific antigen, a control trial with other parallel tests was necessary. W.H.O. and U.N.I.C.E.F. sponsored the antigen preparation unit at the All-India Institute of Hygiene and Public Health at Calcutta, and were also responsible for helping to establish the penicillin factory at Pimpri. U.N.I.C.E.F. also donated penicillin in oil with 2 per cent. aluminium monostearate (P.A.M.) and antigen for use in women and children suffering from syphilis until the Pimpri factory achieved large-scale production in 1955 and the antigen unit released its own product in 1956.

In 1950, a course of training in serology was conducted at this department, and twelve venereologists, ten medical officers, and eight technicians attended a course under a W.H.O. expert. The Haffkine Institute was chosen as a central reference laboratory for standardizing the serological tests for syphilis. As more and more laboratories accepted the W.H.O. technique for serology and the P.A.M. regimen for treatment, this department was authorized to provide free supplies of antigen to other institutions in this city, and gradually the Meinicke slide test became established at five other large hospitals in Bombay. The Indian Council of Medical Research also appointed an advisory

committee on venereal diseases to organize research on related problems, and the chief of the V.D. section of W.H.O. headquarters in Geneva visited this department in 1951. It was agreed that:

- (1) The minimum dosage of P.A.M. should be 4.8 mega units;
- (2) Penicillin should be the only treatment;
- (3) The infectivity rate would be much reduced by using P.A.M.;
- (4) Mass serology and contact serology were important in the V.D. programme;
- (5) Adequate numbers of social workers should augment the control projects.

In 1950, the J.J. Group of Hospitals spent Rs.20,000 on the treatment of venereal diseases. Some of the other smaller hospitals spent from Rs.5,000 to Rs.8,000 per year. The bulk of this money was used to buy arsenic or bismuth preparations at Rs.40 per patient for two courses per year. Treatment with P.A.M. now costs Rs.12 for two courses per year.

W.H.O. maintained its interest at both regional and headquarters level in the serological work and reports were submitted from this institution every half year from 1951 to 1956. In June, 1954, the V.D.R.L. qualitative and quantitative slide tests were introduced as a routine. The staff has been increased by the Government of Bombay and now that W.H.O. and U.N.I.C.E.F. have largely withdrawn their supplies of penicillin and antigen, the programme is carried out as an institutional routine independent of help from these bodies.

Material

From 1951 to 1956 inclusive, 104,317 patients from various departments were subjected to the Meinicke test. Though a number of other tests are performed in this laboratory, the present data are based on the results of the Meinicke test alone under the conditions mentioned above, and on the facts recorded in the serology registry. No information is available regarding follow-up, treatment, or exact ultimate diagnosis. However, a test was usually asked for in almost every case attending the venereal diseases department throughout this period. Every donor at the blood bank and every antenatal case was tested during the years 1954-55-56. About 50 per cent. of the total admissions to hospital were tested in 1951; 6.6 per cent. in 1952; 7.2 per cent. in 1953; 8.9 per cent. in 1954, 7.7 per cent. in 1955; and 9.27 per cent. in 1956. The 1951 rate was higher because of the special pilot programme in the initial stages of the inquiry. For a continuous period of 8 months during 1950-51,

every case admitted to this hospital was tested unless it was contraindicated. For the rest of the period, cases were selected by the clinician, the usual criteria being that either syphilis was suspected or had to be excluded.

Method

In patients with suspected primary lesions, a dark-ground microscopic examination was made. While in the present report comparison is based only on the results of the Meinicke test, in the initial stages of the work the Kahn test was also performed. In the last 3 years, the V.D.R.L. test replaced the Kahn test and where a serum was reactive with both Meinicke and V.D.R.L. tests, the quantitative V.D.R.L. test was also performed. Where the serum was non-reactive, or reactive in both the tests, no further test was done unless a repetition was ordered by the clinician. Where only one of the tests was positive, a third test, Kahn or Price's Precipitation Reaction (P.P.R.) was employed. The readings were reported as reactive, weakly reactive, and non-reactive. The total number of serological tests performed during this period was 151,838, including the Meinicke tests. From time to time comparative tests were done when a batch of antigen was being changed, and no batch was accepted unless it proved satisfactory. Parallel testing with a reference laboratory in Bombay was done every month. In 1953, this laboratory also entered the serological evaluation programme conducted, with the help of W.H.O., by the upgraded V.D. Laboratory in Madras. The Meinicke test showed 97 per cent. specificity at this laboratory as compared with 100 per cent. at the reference laboratory in Madras. The sensitivity of our test was 85 per cent. compared with 89 per cent. of that at the reference laboratory. The reproducibility of our test was 91 per cent. compared with 100 per cent. obtained by the reference laboratory. Our laboratory had an average of 98 per cent. agreement with the local reference laboratory in the tests every month.

Results

(1) **Overall Comparison between Meinicke Reaction and Other Tests.**—The percentage of overall agreement in reactors to the Meinicke and V.D.R.L. tests was 94.53 per cent. in 37,149 tests. The percentage of overall agreement in reactors to the Meinicke and Kahn tests was 90.27 in 1,203 tests. The percentage of overall agreement in reactors to the Meinicke test and P.P.R. was 94.3 in 842 tests (Darekar and Jhala, 1957).

It is not possible to give an assessment of sensitivity or specificity of the test, as the history sheets were not sent to this laboratory with the specimens. Darekar and Jhala (1957) have shown earlier the relative specificity and sensitivity of the P.P.R. and Meinicke test as obtained at this laboratory. In the serological evaluation programme, too, our laboratory had achieved the technical standards laid down for the purpose.

(2) **Initial Incidence of Reactivity.**—Table I shows the reactivity to the Meinicke test in the various groups of cases admitted to certain sections of the J.J. Group of Hospitals during the continuous period of 8 months in 1950–51, when almost every newly admitted case was tested, and these figures give an average picture of the conditions existing in 1950–51. During this period, the age group 21–25 years contained the maximum number of patients, followed by those in the age group 45–50. The reactivity rate was highest in the age group 41–50, followed by that of the age group 21–25. The reactivity rate was highest in male medical cases and lowest in the antenatal cases.

Table I shows the average reactivity rate in the different groups of unselected patients, and in pregnant women, the latter reflecting the rate for the healthy population.

TABLE I
PERCENTAGE SERO-REACTIVITY RATES IN VARIOUS GROUPS (1950-51)

Type of Case		No. Seroreactive	Total Tested	Percentage Positive
Medical ..	Male ..	339	1,289	26.29
	Female	74	439	16.85
Surgical ..	Male ..	134	828	16.18
	Female	46	265	17.35
Total Surgical		180	1,093	16.53
Total Medical		413	1,728	23.90
Total Male		473	2,117	22.34
Total Female		120	704	17.04
Total Patients		593	2,821	21.64
Antenatal Cases		68	412	16.15
Grand Total		601	3,233	20.14

As pregnancy is one of the listed causes of non-treponemal reactions in serology, however, it was considered necessary to obtain for comparison another representative group of the healthy population and blood donors were accordingly chosen. In the Blood Bank of this institution, the donors available mostly belong to the lower social class income groups, and generally speaking, our patients

are from the same strata of society. The reactivity rate to the Meinicke test in the blood donors was 18.6 per cent. in a series of 729 tested in the last half of 1950.

(3) **Trends and Rate in Clinics.**—Table II shows the reactivity rates for 1950, 1955, 1956, and the average rate for the seven years 1950 to 1956. The observations were made each year, but only the figures for 1950, 1955, and 1956 are given.

Table II (overleaf) refers to men and women attending the various clinics or admitted to the various wards. Sera referred came only from patients selected by the clinician and the figures in Table II are not therefore comparable to those in Table I. The highest incidence of sero-positivity was found in V.D. cases, being higher in males than in females. Throughout Table II, the incidence in 1956 is lower than the average 7-years incidence, female ophthalmic cases excepted. The general decline in 1956 can probably be attributed to the increased use of penicillin. The rates for the healthy groups (antenatal cases and blood donors) are also much lower in the later years. The overall decrease in patients is only 6 per cent. but there is a reduction of 22.5 per cent. in the reactivity rate of positive reactors. Further analysis shows that 1955 had the lowest incidence in all the groups and also in the total number of patients, and that the rates increased slightly in 1956. One possible explanation of the rise in 1956 is an increase in the sources of infection, e.g. in brothels. Serological relapse is a second possibility. A negligible fraction of our patients default before completing the course of P.A.M., but all patients have one injection; this will probably reduce infectivity, thus lowering the incidence in the population, but may later permit late manifestations in incompletely-treated patients. Thus the incidence of infection in the general population may diminish, but the reactivity rate in hospital patients may gradually rise. It is our surmise that both these factors are at work.

We have no information regarding the infectivity rate in brothels, but the data from state-controlled beggar homes, homes for neglected children, and rescue homes for women and for juvenile offenders are interesting (Table III, overleaf).

The incidence in these homes is known to be almost as heavy as in patients attending venereal disease clinics (so much so that a venereal diseases specialist treats them on the premises). The seroreactivity rates in these homes began to rise as early as 1955, when the hospital patients still continued to show a decline. Fortunately, these patients are under careful control though their population is

TABLE II
PERCENTAGE SERO-REACTIVITY RATES IN VARIOUS CLINICS OF THE J.J. GROUP OF HOSPITALS IN 1950, 1955, 1956, AND 1950-56

Year	Average 1950-56		1950		1955		1956	
	Total Sera Tested	Percentage Positive	Total Sera Tested	Percentage Positive	Total Sera Tested	Percentage Positive	Total Sera Tested	Percentage Positive
V.D.: Male	27,033	42.83	3,083	55.36	3,478	31.22	4,515	35.53
Female	9,671	36.21	1,010	38.10	1,360	27.46	1,422	30.03
Medical: Male	18,892	27.03	2,025	31.30	2,504	18.01	1,921	22.51
Female	4,886	16.92	510	20.39	638	11.44	431	12.30
Surgical: Male	4,817	23.37	907	18.96	636	16.98	378	22.92
Female	1,278	21.40	227	18.93	136	12.5	185	21.76
Ophthalmic: Male	2,297	26.60	314	35.90	391	23.27	366	20.22
Female	346	19.06	51	19.60	51	9.8	56	21.95
Children	1,320	15.88	170	27.06	210	10.95	161	8.07
E.N.T.: Male	1,428	24.90	158	33.71	245	18.35	243	18.18
Female	281	18.07	24	25.00	54	11.11	63	12.19
Psychiatric: Male	575	13.18	48	12.50	93	15.15	76	9.21
Female	168	10.84	8		15	6.66	14	7.14
Dermatology: Male	1,639	28.88	112	39.28	286	16.78	213	18.53
Female	228	30.52	15	33.3	28	25.00	29	14.7
Dental: Male	236	18.20	33	24.24	13	too few	3	too few
Total Male	56,906	33.92	6,680	40.09	7,646	25.49	7,715	29.87
Total Female	16,859	28.33	1,845	29.97	2,282	20.72	2,200	25.27
Total Patients	73,765	32.74	8,525	38.53	9,928	24.38	9,915	28.85
Antenatal Cases	17,133	13.58	484	17.84	4,020	7.91	4,162	9.06
Blood Donors	6,860	14.37*	47	17.00	2,756	14.51	1,821	14.17
Grand Total	99,285	27.40	9,226	37.09	1,6914	18.7	16,059	21.22

* 5-yr average only

TABLE III
SERO-REACTIVITY RATE IN STATE-CONTROLLED BEGGAR HOMES, RESCUE HOMES, REMAND HOMES, ETC.

Year	No. of Sera Tested	Percentage Positive
1954	324	31.17
1955	294	54.67
1956	276	53.99
1950-56	1,816	31

an ever-changing one. Table III suggests that the sources of infection have been on the increase.

Examination of the cerebrospinal fluid may provide information regarding incompleteness of treatment in which ignorance and poverty play a large part. The cerebrospinal fluid reactivity rate at the venereal disease clinic was 35.17 per cent. in 1956, but the average cerebrospinal fluid reactivity rate for the same group in 1950-56 was 30.9 per cent. The cerebrospinal fluid reactivity rate in all types of case has shown a progressive decline from 1950 to 1955, but a slight rise in 1956. In our venereal disease patients, every suspected sore is examined for *Treponema pallidum* by dark-ground

microscopy. From 1950-56, a total of 27,136 dark-ground examinations were made; the average positive rate for 1950-56 was 10.7 per cent., while in 1955 and 1956 the rates were 8.95 and 8.59 per cent. respectively. The lowest positive rate in the seven years occurred in 1956, and it thus appears that P.A.M. treatment continues to reduce primary and infective lesions although incomplete treatment through default is creating a back-log of neurosyphilis. Landy, Rein, Thomas, and Kelac (1956) and Fernandez (1951) have shown that sero-reactivity persists for a long time after a complete penicillin regimen and it is difficult to interpret sero-reactivity alone unless repeated and quantitative assessments are available. While such assessments are not available in this series, experience shows that most patients attend this hospital because of symptoms and not for a check-up of sero-reactivity. In 3,216 cerebrospinal fluid examinations, the reactivity rate was 13.9 per cent. for 1950-56, 9.19 per cent. in 1955, and 13.2 per cent. in 1956. If we exclude the venereal disease cases in the cerebrospinal fluid series, there was 12.9 per cent. reactivity in 1950-56, 9.62 per cent. in 1955, and 10.69 per

cent. in 1956. In other words, the reactivity in the cerebrospinal fluid has followed the pattern of sero-positivity in the hospital patients except in the venereal diseases group, which substantiates our belief that the back-log caused by incomplete treatment is an important factor.

Latent syphilis may be a legacy of incomplete treatment with P.A.M. or of the previous arsenic and bismuth era. In 1950-51, Fernandez (1951) conducted a small trial to calculate treatment lapses by patients in this institution. With free penicillin, less than 2 per cent. lapsed from complete treatment in a series of over 1,000 cases. With free arsenic-bismuth therapy there were 24 lapses out of 100. The present back-log of latent syphilis may therefore date from the pre-penicillin era.

Sharma and Gharpure (1956), who reported on 1,500 autopsies performed in 1951-55 on patients admitted (not just brought in dead) to this institution, found cardiovascular syphilis in 2 per cent. of the total series of autopsies. The evidence included a positive serological test, histological changes of endarteritis with perivascular mononuclear infiltration, gross scarring, thickening and deformity of the aorta with narrowed coronary ostia, widened commissures, and scarred valves, etc. Aneurysms were also seen. The abdominal aorta was as commonly affected as the arch. These authors state that, in spite of the universal use of penicillin

in early and late syphilis, a large number of undiagnosed, untreated, or insufficiently-treated cases of syphilis continue to be encountered in the autopsy room. It is therefore concluded that the incidence of syphilis continues high and that stringent public health legislation, anti-venereal campaigns, and social work are urgent necessities in this city.

Summary

Retrospective analysis of sero-positivity rates in 104,317 sera, 3,216 cerebrospinal fluid, and 27,136 dark-ground examinations, collected from the years 1950-56 is presented to show incidences, trends, and problems in the anti-venereal work of this region.

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