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STUDIES IN RHINOSPORIDIOSIS

by

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PART I

RHINOSPORIDIOSIS IN THE HUMAN FEMALE

Seeber of Buenos Aires reported the first case of infection in the male and drew attention to a similar case observed by Malbran in 1892. Many years, however, were to elapse before Tirumurti (1924) reported the occurrence of the disease in a female in India.

In a paper on this subject published in 1958 I described 70 cases of the disease in Ceylon together with 38 cases recorded in other countries. Although the disease in the female is comparatively rare, 150 cases were observed in Ceylon. We have also been able to find 66 cases reported in other countries making a total of 216 cases. Ninety-eight further cases have been recorded in India but since the site of infection is not clearly stated, they could not be classified. It would thus appear that more than 300 cases of infection in the female have been reported up to the present.

In this paper we give an account of the disease in different countries and in the various races. Further, in regard to Ceylon, an analysis is made of its relative frequency among the different racial groups of the Island. The incidence of the disease in the different races is also compared with its percentage distribution in the population. I have taken the population figures of the 1946 census as these are likely to give a fairly reliable picture of the racial distribution of the population during the mid-period of our observations.

It is worth noting that the Sinhalese comprise more than 77 per cent of the infected cases in Ceylon and 53·7 percent of all cases in females. With a view to determining whether sex has any bearing on this high percentage, a comparison has been made between the two sexes as regards the incidence of the disease in the nose and eye—the two common sites of infection, the age distribution, duration and recurrence. The percentage incidence of the disease has also been compared with that of the population.

An account of the developmental cycle of the parasite, and a description of the naked-eye and microscopical changes in the infected tissues have been omitted ; nor have I included a historical summary of the disease ; these aspects of the subject have already been described in detail in several publications (Ashworth, 1923; Karunaratne, 1936 and 1958).

The first reported cases of infection in the female in different countries

As mentioned earlier, Tirumurti (1924) reported the first case of infection in a female; the patient was an Indian with frequent recurrences of a growth in the nose. In the following year Denti described the disease in the eye of an Italian woman from Lombardy. In 1933 we observed two cases of nasal infection in females in Ceylon. Warthin (1930) observed an organism resembling *Rhinosporidium* in the tonsillar crypts of a woman in the United States, but the first undisputed case of rhinosporidial infection in that country was reported by Ruchman (1939) in the nose of an Austrian woman long resident there.

In the same year Habibi observed the disease in Iran. In 1942 the occurrence of the disease was recorded in three different countries: Blanco and Abalo in a young girl in Cuba, Aben-Athar in a child in Brazil and di Pietro in a woman in Argentina.

The first case in Africa was reported in a native of Uganda by Boase (1941). A description of the first case in Malaya, an Indian female with recurrent growths in the nose, is cited in the Singapore Hospital Records (1950). Two cases of eye infection in Congolese girls in the Belgian Congo were reported by Defrenne *et al.* in 1954 and in the following year Atav *et al.* described a case of nasal infection in a peasant girl in Turkey. In 1957 Lapeyssonnie *et al.* observed infection of the nose in a Hindu girl in Pondicherry.

Cases of Rhinosporidiosis in the Female observed in Ceylon*

Year	*Nose*	*Eye*	*Less common or rare sites*	*Infection at more than one site*
1933—1940	7	4	1	—
1941—1945	8	10	1	—
1946—1950	15	8	—	1
1951—1955	21	9	4	—
1956—1961	16	11	2	2
1962	4	4	—	—
1963	2	3	1	—
1964	6	3	—	1
	79	52	9	4

*Six cases of infection of the nose in the female were personally communicated to me by Dr. A. G. Fernando of the Pathology Department, University of Ceylon. These have not been included in the above table.

My series of cases

Racial and Site distribution

Race	*Nose*	*Eye*	*Less common or rare sites*	*Infection at more than one site*	*Total*
S.	60	41	9	2	112
M.	2	3	—	1	6
T. (C.)	12	6	—	—	18
T. (I.)	4	2	—	1	7
Mle.	1	—	—	—	1
Mly.	—	—	—	—	—
	79	52	9	4	144

Abbreviations: S. = Sinhalese M. = Moor T.(C.) = Ceylon Tamil
T.(I.) = Indian Tamil Mle. = Malayalee Mly. = Malay

Summary of Author's series of cases of infection in the human female

1. Infection of the Nose

No.	*Year*	*Age in years*	*Race*	*Side affected*	*Duration*	*Complaints and Comments*
1	1933	35	S	L	2 y.	Bleeding from nose
2	1933	80	T(I)	R	--	—
3	1935	20	S	R	—	Difficulty in breathing
4	1936	38	T(I)	L	12 y.	Removed once previously; epistaxis since childhood
5	1937	14	S	—	6 m.	
6	1937	28	S	R	10 m.	
7	1940	30	S	R	4 y.	Difficulty in breathing; previous operation two years ago
8	1941	8	M	L	1 y.	Blocking of nose and bleeding
9	1942	22	S	L	6 m.	Bleeding from nose and difficulty in breathing
10	1943	28	S	R	4 y.	Blood-stained discharge and difficulty in breathing; her 10-year-old son too had a nasal growth which recurred.
11	1944	35	S	L	—	—
12	1944	11	S	—	2 m.	
13	1944	18	S	—	5 m.	Bleeding from nose
14	1945	19	S	L	4 m.	Discharge – offensive and blood-stained
15	1945	18	S	R	1 y.	Bleeding from nose, difficulty in breathing later.
16	1946	12	S	R	8 m.	Bleeding occasionally; history of trauma
17	1946	14	S	—	1½ y.	Bleeding from nose; difficulty in breathing
18	1946	10	S	L	6 m.	Mucoid discharge from nose
19	1947	11	S	R	1 m.	Bleeding from nose
20	1948	21	S	R	—	Bleeding from nose
21	1948	12	S	L	1 m.	—
22	1949	13	T(C)	R	—	—
23	1949	20	Mle	—	6 m.	One previous operation for growth
24	1949	20	S	—	4 m.	—
25	1949	—	S	L	—	—
26	1950	—	S	R	—	—
27	1950	18	S	L	1 y.	Bleeding from nose
28	1950	14	S	—	6 m.	—
29	1950	10	S	R	10 m.	Blocking of nose
30	1950	75	S	—	—	Growth causing obstruction to breathing
31	1951	11	T(I)	—	1 m.	—
32	1951	55	T(C)	L	—	—
33	1951	13	S	L	4 m.	—
34	1951	40	T(C)	L	3 m.	—
35	1952	50	T(C)	L	3 m.	Bleeding from nose
36	1953	18	S	L	—	Recurred twice after removal
37	1954	46	T(C)	R	—	—
38	1954	12	S	L	6 y.	Blood-stained discharge and blocking of nose
39	1954	60	T(C)	R	2 y.	Bleeding from nose
40	1954	29	S	L	5 m.	—
41	1954	45	S	R	3 y.	Blocking of nose
42	1954	13	S	L	4 m.	—
43	1955	8	S	R	2 m.	—
44	1955	11	S	L	3 m.	Blood-stained discharge
45	1955	14	S	Both sides	6 m.	Bleeding; difficulty in breathing
46	1955	25	S	R	6 m.	—

47	1955	13	S	L	10 m.	Difficulty in breathing
48	1955	12	S	L	2 m.	—
49	1955	13	S	—	—	—
50	1955	7	S	L	—	—
51	1955	10	T(C)	—	3 m.	—
52	1956	22	S	R	—	Bleeding; nasal obstruction
53	1956	29	S	R	1½ y.	Discharge from nose: difficulty in breathing
54	1956	6	T(C)	R	3 m.	—
55	1956	6	T(I)	R	3 m.	Bleeding from nose
56	1956	20	T(C)	L	—	Blocking of nose
57	1957	14	S	—	—	—
58	1957	24	S	L	—	Blocking of nose
59	1957	27	T(C)	—	—	—
60	1959	20	S	L	2 m.	Breathing difficult
61	1959	13	S	—	—	—
62	1959	12	S	L	2 w.	Blocking of nose; watery discharge
63	1959	3	S	L	2 m.	Blood-stained discharge
64	1960	18	S	—	—	Blocking of nose
65	1960	38	S	L	—	Difficulty in breathing: blood-stained discharge
66	1960	8	S	L	2 m.	—
67	1960	8	S	L	—	Blood-stained discharge
68	1961	11	S	L	1 y.	Blood-stained discharge
69	1961	15	S	—	—	—
70	1961	12	S	R	1 y.	Blood-stained discharge; growth previously operated 3 years ago
71	1961	11	S	R	2 m.	A patient in adjoining house with similar trouble
72	1961	35	T(C)	R	9 m.	—
73	1962	22	S	R	—	—
74	1963	14	S	L	1 y.	Growth arising from anterior end of inferior turbinate; watery discharge
75	1963	11	S	R	—	Bleeding
76	1963	13	S	L	8 m.	Fleshy growth; obstruction to breathing
77	1963	18	S	—	1½y.	Growth arising from nasal septum; obstruction to breathing
78	1963	26	T(C)	L	—	Obstruction and bleeding
79	1963	22	M	R	6 m.	Bleeding; growth ulcerated

II. Infection of the eye

A. Eyelid

No.	*Year*	*Race*	*Age in years*	*Location of lesion*	*Duration in months*	*Complaints and Comments.*
1	1936	T(I)	35	R. upper	4	—
2	1939	S	10	L	6	Growth
3	1939	S	11	L. lower	2	Discomfort in eye
4	1940	S	30	L. lower.	2	2 months since last operation; two previous operations for growth
5	1941	M	60	L. lower.	2	Growth
6	1943	S	60	Lower	—	—
7	1943	S	11	L. upper	4	Irritation of the eye; lachrymation
8	1944	S	20	R	8	A small growth was removed from the same site about 2 years ago
9	1944	T(C)	—	—	4	Lachrymation
10	1945	S	45	L. lower	—	Growth
11	1945	S	11	L. upper	10	Irritation of eye

12	1945	S	9	Lower	2	A piece of wood struck eye about 3 months back; a month later growth noticed. Brother had rhinosporidial growth removed from right eye about a month earlier
13	1945	S	15	L. upper	2	Two previous operations for growth
14	1947	S	60	L	1	Previously operated on 2 years ago
15	1947	T(C)	—	—	4	—
16	1947	S	11	—	—	—
17	1948	S	10	R. lower	2	Irritation; lachrymation
18	1948	T(I)	25	L	8	Some months back child struck the mother's eye with a cane; growth appeared within a month or so
19	1948	S	13	R. upper	3	Blood-stained discharge
20	1949	S	10	R. lower	2	—
21	1950	S	57	—	6	—
22	1951	S	45	L	2	A blade of grass injured left eye; growth appeared sometime later
23	1951	M	35	Lower	2	Growth; flow of tears
24	1951	S	65	R. upper	3	Growth; felt something rubbing against the eye ball
25	1952	S	35	R	2	—
26	1952	S	7	L. lower	—	Flow of tears
27	1955	S	13	R. lower	—	Growth; slight discharge
28	1955	S	29	L	1	—
29	1955	S	40	L	10	—
30	1955	T(C)	7	Upper	2	Growth
31	1956	S	40	Upper	8	Growth; copious tears
32	1956	S	28	L	6	Growth
33	1956	S	14	Upper	2	—
34	1956	S	40	R. upper	—	Two previous operations for growth
35	1956	S	28	R. lower	1	—
36	1957	S	28	L	4	Growth
37	1958	T(C)	5	L. upper	1	Growth; flow of tears
38	1959	S	12	L. upper	1	—
39	1959	S	10	L. lower	2	—
40	1961	S	3½	Upper	—	—
41	1961	T(C)	55	—	8	—
42	1961	S	15	—	2	—
43	1961	T(C)	10	Lower	6	Growth—bleeding on and off
44	1962	S	24	L. lower	10	—
45	1962	M	9	L. lower	—	—
46	1962	S	10	R. upper	6	—
47	1963	S	45	R. upper	3	Very vascular growth
48	1963	S	5	Lower	1	Fleshy growth
49	1963	S	12	R. upper	2	—

B. Other sites

No.	*Year*	*Race*	*Age*	*Location of lesion*	*Duration*	*Complaints and Comments*
1	1945	S	25	Caruncle	1	Congestion of eye; granular growth present
2	1956	S	35	R. limbus	4	Growth; eye congested
3	1961	S	9	L. bulb	4	Growth

III. Less common or rare sites

No.	*Year*	*Race*	*Age*	*Location of lesion*	*Duration*	*Complaints and comments*
1	1938	S	8	Vagina	1 w.	Sanious discharge
2	1943	S	9	R. lac. sac	4	Swelling with discharge of blood and pus

3	1951	S	9	Tonsil	9-10	Enlarged tonsils; only one showed rhinosporidial infection
4	1951	S	22	Nasopharynx	—	Case was diagnosed as one of nasopharyngeal fibroma.
5	1951	S	40	Nasopharynx	8	Blood-stained discharge; growth seen in throat
6	1951	S	30	Nasopharynx	1½ y.	Difficulty in breathing
7	1957	S	26	Nasopharynx	—	Difficulty in breathing
8	1959	S	30	Nasopharynx	8	—
9	1962	S	20	L. lac. sac	5 y.	Swelling below left eye; on pressing lump salty taste experienced in the mouth

IV. Infection at more than one site

No.	*Year*	*Race*	*Age*	*Location of lesion*	*Duration*	*Complaints and comments*
1	1950	S	28	R. nose and skin over ala nasi	1 y.	Lump in skin over right ala nasi; growth in right nose
2	1959	S	17	L. nose	2 y.	Operated for growth at inner canthus of eye 3 years ago
3	1959	M	35	L. nose and back of soft palate	—	In 1958 operated for growth in left nose
4	1963	T(I)	30	Nose and skin	—	Bleeding from nose; growth operated on 15 months ago; warty growth on outer aspect of right upper arm 6″ above elbow joint; 3 months duration. A similar warty growth on skin of right upper arm 1½″ above elbow joint was excised 6 months ago.

CEYLON

Incidence of Infection of nose and eye in the different races compared with population percentage*

Race	*Nose*			*Eye*	
	Infected sites		*Population Percentage (Census 1946)*	*Infected sites*	
	Number	*Percentage*		*Number*	*Percentage*
S	64	75.3	70.4	41	78.8
M	2	2.3	5.8	3	5.8
T(C)	13	15.3	11.2	6	11.5
T(I)	5	5.9	11.2	2	3.8
Mlo	1	1.2	All others		
Mly	—	—	1.4		
Total	85	100.0	100.0	52	99.9

*The six cases of nasal infection observed by Fernando have been included: S. 4; T. (C.) 1; T.(I.) 1.

Percentage of infection in the Sinhalese and the Ceylon Tamil is higher than the population percentage in both nasal and eye infection. In the Sinhalese, it is higher in eye infection than in nasal infection; in the Ceylon Tamil, it is lower in eye infection than in infection of the nose.

In the Indian Tamil, percentage of infection is lower than the population percentage in both nasal and eye infection; it is lower in eye infection than in infection of the nose.

In the Muslim, the percentage of nasal infection is two-fifths of the population percentage, but in eye infection the percentage is the same.

Cases of special interest

(*a*) youngest and oldest.

Nose			*Eye*		
No.	*Age*	*Race*	*No.*	*Age*	*Race*
63	3	S	40	3½	S
54	6	T(C)	37	5	T(C)
55	6	T(I)	48	5	S
50	7	S	26	7	S
30	75	S	30	7	T(C)
2	80	T(I)	6	60	S
			5	60	M
			14	60	S
			24	65	S

Rare sites

No.	*Age*	*Race*
1	8	S
2	9	S
3	9	S
5	40	S

Infection at more than one site

There are only four in this group—2 S. aged 17 and 28, a Muslim aged 25, and an Indian Tamil aged 30.

Possibility of contact infection

Nose				*Eye*			
No.	*Race*	*Age*		*No.*	*Race*	*Age*	
10	S	28	Son aged 10 had a nasal growth which recurred.	12	S	9	Brother had a rhinosporidial growth removed from the eye.

History of trauma

16	S	12	History of injury	18	T(I)	25	Some months back child struck the eye with a cane; growth appeared within a month or two.
				12	S	9	A piece of wood struck the eye about 3 months back; a month later noticed growth.
				22	S	45	A blade of grass injured left eye; a growth appeared sometime later.

Recurrences

Nose: Nos. 4, 7, 23, 36, 70

Eye: Nos. 4, 8, 13, 14, 24

Side affected
Nose

Race	*Right*	*Left*	*Bilateral*	*Unspecified*	*Total*
S	19	27	1	13	60
M	1	1	—	—	2
T(C)	5	5	—	2	12
T(I)	2	1	—	1	4
Mle	—	—	—	1	1
Total	27	34	1	17	79

Eye

S	13	18	—	10	41
M	—	2	—	1	3
T(C)	—	1	—	5	6
T(I)	1	1	—	—	2
Total	14	22		16	52

Location of lesion

Nose

Race	*Septum*	*Inferior turbinate*	*Floor*	*Middle turbinate*	*Floor and inferior turbinate*	*Total*
S	10	6	4	1	2	23
M	—	1	—	—	—	1
T(C)	1	1	—	—	1	3
T(I)	1	—	—	—	—	1
Mle	1	—	—	—	—	1
Total	13	8	4	1	3	29

Details of Cases

Septum: Nos. 7, 16, 20, 23, 24, 28, 31, 33, 34, 41, 52, 73, 77
Inferior turbinate: Nos. 6, 8, 19, 36, 44, 65, 72, 74
Middle turbinate: No. 18
Nasal floor: Nos. 5, 9, 13, 68
Floor and inferior turbinate: Nos. 3, 17, 35

Location of lesion

Eye

	Lids						*Other Sites*		
Race	*Upper*	*Lower*	*Unspecified*	*Bulb*	*Caruncle*	*Limbus*	*Inner canthus*	*Outer canthus*	*Total Sites*
S	13	13	12	1	1	1	—	—	41
M	—	3	—	—	—	—	—	—	3
T(C)	2	1	3	—	—	—	—	—	6
T(I)	1	—	1	—	—	—	—	—	2
Total	16	17	16	1	1	1	—	—	52

Clinical characteristics

Infection of the nose

Details were available in 46 cases. The commonest complaint was difficulty in breathing in 29 or 63·3 per cent; in 7 instances it was the sole symptom; in 7 others it was associated with bleeding from the nose; in 5 with a discharge. A tumour was observed in 10 cases of respiratory obstruction, in 2 there was also bleeding from the nose and in 2 a discharge was also present.

In 17 cases there was no obstruction to breathing: bleeding was the complaint in 11 and the presence of a discharge in 6. The discharge was usually blood-stained; it was watery in 1, mucoid in 1 and blood-stained and offensive in one.

Infection of the eye

A clinical history was available in 32. The presence of a growth was the sole complaint in17 cases; there was a history of injury in 3. In 8 others there were signs or symptoms in addition; flow of tears (3), discharge (1), irritation (1), bleeding (1), congestion (2).

The remaining 7 had the following complaints: irritation or discomfort in the eye (2), flow of tears (2), blood-stained discharge (1), irritation and lachrymation (2). Thus in over 78 per cent of the cases the presence of a growth by itself or in association with other signs or symptoms was observed. This is in marked contrast to what obtained in infection of the nose where a growth was present in only 10 or 21·8 per cent.

The age distribution, duration of the infection and recurrences in the female are considered in Part II where these are contrasted with those in the male.

Sinhalese males and females compared

1. Sites of infection

All sites: S. males 279; S. females 116.

	Nose		*Eye*		*Uncommon or rare sites*		*Infection at more than one site*	
	M	F	M	F	M	F	M	F
No. of cases	159	64	94	41	17	9	9	2
Percentage	57.0	55.2	33.7	35.3	6.1	7.8	3.2	1.7

If we take the two common sites of infection, viz. the nose and the eye, we find only a slight difference in the percentage of infection in the S. male and S. female. The percentage of nasal infection is slightly higher in the male and the percentage of eye infection slightly higher in the female.

2. Age distribution

Age group	10—14	20—24	*All age groups*	*Cases under 15 years of age*	
				No. of cases	*Percentage*
Infection of the nose					
S. male	19	32	139	26	18.7
S. female	26	8	58	31	53.4
Infection of the eye					
S. male	17	4	90	33	36.7
S. female	15	2	41	19	46.3

In both nasal and eye infection, there is a higher percentage of Sinhalese females than of Sinhalese males below 15 years of age. In nasal infection more than 50 per cent of the females are below 15 years of age; nearly three times that of males. A higher percentage of Sinhalese males is seen in eye infection than in nasal infection (nearly twice that of nasal infection) and a higher percentage of Sinhalese females is found in nasal infection than in eye infection.

3. Recurrences

In 148 cases of nasal infection in Sinhalese males recurrences were noted in 15, that is, one recurrence in 9·9 cases of infection.

In 60 cases of nasal infection in Sinhalese females, recurrences were observed in 3, that is, one recurrence in 20 cases.

Rate of recurrence in the Sinhalese male is about twice that in the Sinhalese female. In 94 cases of eye infection in Sinhalese males, recurrence were seen in 10, i.e. 1 recurrence in 9·4 cases; in 41 cases in Sinhalese females, there were 5 cases with recurrence, i.e. 1 recurrence in 8·2 cases. In infection of the eye, recurrence rate is slightly higher in the female than in the male.

4 Incidence of nasal and eye infection compared with the population percentage

	Nasal infection			Eye infection	
	No. of cases	*Percentage*	*Population Percentage*	*No. of cases*	*Percentage*
S. Males	159	46.2	68.5	94	67.1
S. Females	54	75.3	70.4	41	78.8

Nasal infection in Sinhalese male is ·67 of population percentage; in Sinhalese female, it is 1·07 of population percentage.

Eye infection in Sinhalese male is ·98 of population percentage; in S. females it is 1·1 of population percentage.

Incidence of nasal and eye infection in the Sinhalese female is higher than the population percentage; in the male it is lower than the population percentage; in the case of the eye, however, it is only slightly below the population percentage.

The very low incidence of nasal infection in the Sinhalese male is worthy of note.

Cases recorded in other countries

	Date	*Country*	*Nose*	*Eye*	*Rare sites*	*Infection at more than one site*	*Total*
Tirumurti, T. S.	1924	India	1	—	—	—	1
Denti, V.	1925	Italy	—	1	—	—	1
Cherian, P. V. and Vasudevan, A.	1929	India	—	—	—	1	1
Norrie, F. H. B.	1929	India	1	—	—	—	1
Warthin, A. S.	1930	U. States	—	—	1	—	1
Kurup, P. K.	1931	India	—	—	1	—	1
Smith, H. M.	1932	India	1	—	—	—	1
Allen, F. R.W. K.	1935	India	4	—	—	—	4
Allen, F. R.W. K. and Dave, M. L.	1936	India	8	2	—	1	11
Habibi, M.	1936	Iran	1	—	—	—	1
Ruchman, J.	1936	U. States	1	—	—	—	1
Blanco, F. L. and Abalo, M. A.	1944	Cuba	1	—	—	—	1
Aben-Athar, J.	1944	Brazil	1	—	—	—	1
di Pietro, A.	1944	Argentina	1	—	—	—	1
Habibi, M.	1944	Iran	4	—	—	—	4
Ormsby, O. S. and Brown, E. V. L.	1946	U. States	—	1	—	—	1
Habibi, M.	1947	Iran	2	—	—	—	2
Boase, A. J.	1947	Uganda	—	1	—	—	1
Murga, J. F. and Latienda, R. I.	1947	Argentina	1	—	—	—	1
Marks, R. F. and Johnstone, H. G.	1948	U. States	1	—	—	—	1
Rambo, V. C.	1949	India	—	—	1	—	1
Cherian, P. V. and Satyanarayana, C.	1949	India	—	—	1	1	2
Murga, J. F. and Latienda, R. J.	1949	Argentina	1	—	—	—	1
Singapore Hospital Records	1951-52	Malaya	1	—	—	—	1
Borzone, R. A. and Lapieza Cabral, P.	1951	Argentina	—	—	1	—	1
Purandare, N. M. and Deoras, S. M.	1953	India	1	—	—	—	1
Defrenne, P., Dorzee, J., Appelmans, M. and Jansen, E.	1953	Belgian Congo	—	2	—	—	2
Habibi, A. (Personal Communication)	1954	Iran	6	—	—	—	6
Atav, N., Göksan, T. and Ural, A.	1955	Turkey	1	—	—	—	1
Coutinho, E. M.	1955	Brazil	—	—	1	—	1
Vanbreuseghem, R., Thys, A. and Henrot, L.	1955	Belgian Congo	—	1	—	—	1
Lapeysonnie, L., Schadry and Nioguy	1957	Pondicherry	1	—	—	—	1
Lahiri, K. D.	1957-58	India	1	—	—	—	1
Vellore Christian College Hospital Records	1958	India	3	—	1	1	5
Sahay, L. K.	1958	India	1	—	—	—	1
Khaleque, K. A.	1963	India	—	1	—	—	1
Kuriacose, E. T.	1963	India	—	1	1	—	2

Geographical and site distribution

	Nose	*Eye*	*Uncommon or rare sites*	*Multiple sites*	*Total*
			Asia		
Ceylon	85	52	9	4	150
India	21	4	5	4	34
Malaya	1	—	—	—	1
Pondicherry	1	—	—	—	1
Iran	13	—	—	—	13
			Africa		
Uganda	—	1	—	—	1
Belgian Congo	—	3	—	—	3
			Europe		
Italy	—	1	—	—	1
Turkey	1	—	—	—	1
			North and Central America		
United States	2	1	1	—	4
Cuba	1	—	—	—	1
			South America		
Argentina	3	—	1	—	4
Brazil	1	—	1	—	2
			Summary		
Asia	121	56	14	8	199
Africa	—	4	—	—	4
Europe	1	1	—	—	2
North and Central America	3	1	1	—	5
South America	4	—	2	—	6
	129	62	17	8	216

A further 98 cases in females mentioned below have been recorded but these could not be classified as the site of infection is not specified. Cherian and Satyanarayana (1949) 10; Reddi (1954) 17; Henry (1958) 15; Satyanarayana (1960) 50; Sharma *et al.* (1962) 6

Geographical and racial distribution

Infection in females recorded in 13 countries; females only in 3 countries.

Infection of the nose

Race	*No.*	*Country*	*Race*	*No.*	*Country*
Sinhalese	64	Ceylon	Iranian	13	Iran
Moor	3	Ceylon	Turkish	1	Turkey
Ceylon Tamil	13	Ceylon	American white	1	United States
Indian Tamil	5	Ceylon	Austrian	1	United States
Malayalee	1	Ceylon	Cuban	1	Cuba
Hindu	7	India	Argentinian	3	Argentina
Muslim	1	India	Brazilian	1	Brazil
India	13	India			
Indian	1	Pondicherry			
Indian	1	Malaya			

Infection of the eye

Sinhalese	41	Ceylon	Ugandian	1	Uganda
Moor	3	Ceylon	Congolese	3	Belgian Congo
Ceylon Tamil	6	Ceylon	Italian	1	Italy
Indian Tamil	2	Ceylon	American white	1	United States
Indian	4	India			

Infection at rare or uncommon sites

Sinhalese	9	Ceylon	Argentinian	1	Argentina
Indian	3	India	Brazilian	1	Brazil
Hindu	1	India	American white	1	Unites States
Muslim	1	India			

Infection at more than one site

Sinhalese	2	Ceylon
Moor	1	Ceylon
Ceylon Tamil	1	Ceylon
Indian	4	India

Infection in the female in all countries

Side affected

	Nose					Eye				
	R	*L*	*Unspecified*	*Bilateral*	*Total sides*	*R*	*L*	*Unspecified*	*Bilateral*	*Total sides*
Ceylon	22	30	32	1	86	14	22	17	—	53
Other countries	12	17	14	1	45	2	5	2	1	11
Total	34	47	46	2	131	16	27	19	1	64

Nose

Location of Sites

	Septum	*Inf. turb.*	*Nasal floor*	*Middle turb.*	*Floor and Inf. turb.*	*Nasal roof*	*Middle meatus*	*Inf. turb. and septum*	*Total*
My series	13	8	4	1	3	—	—	—	29
Other countries	6	3	—	—	—	1	1	1	12
Total	19	11	4	1	3	1	1	1	41

Eye

		Lids			Other Sites							
	Total cases	*Upper*	*Lower*	*Unspecified*	*Bulb*	*Limbus*	*Caruncle*	*Outer canthus*	*Inner canthus*	*Total lids*	*Total other sites*	*Total all sites*
Ceylon	53	16	17	17	1	1	1	—	—	50	3	53
Other countries*	10	2	4	3	—	—	1	—	1	9	2	11
Total	63	18	21	20	1	1	2	—	1	59	5	64

Ceylon	Lids 94·3 per cent	Other sites 5·7%	Ratio 16·5 : 1
Other countries	Lids 81·8 per cent	Other sites 18·2%	Ratio 4·5 : 1

*In one case—a female aged 7 had a small growth on each of the lower lids close to the inner canthus.

Age distribution

	Nasal Infection			Eye Infection		
	Ceylon	*Other Countries*	*Total*	*Ceylon*	*Other Countries*	*Total*
0—4	1	—	1	1	—	1
5—9	7	3	10	7	2	9
10—14	29	7	36	15	3	18
15—19	8	5	13	2	1	3
20—24	11	5	16	2	—	2
25—29	7	5	12	6	1	7
30—34	1	7	8	1	—	1
35—39	5	1	6	4	—	4
40—44	1	2	3	3	—	3
45—49	2	2	4	3	—	3
50—54	1	5	6	—	—	—
55—59	1	1	2	2	2	4
60—64	1	—	1	3	—	3
65—69	—	—	—	1	—	1
70—74	—	—	—	—	—	—
75—79	1	—	1	—	—	—
80—84	1	—	1	—	—	—
	77	43	120	50	9	59

Ceylon compared with other countries

Infection of the nose

Ceylon: The highest incidence, 29 or 37·7 per cent is in the age group 10–14.

Other countries: There is no age group which shows a high incidence of infection as in Ceylon. The highest incidence, 7 or 16·3 per cent is found in two age groups 10–14 and 30–34.

Infection of the eye

Ceylon: The highest incidence, 15 or 30 per cent is in the age group 10–14.

Other countries: There are only 9 cases of infection of the eye. I have not considered these as regards the age group showing the highest incidence or the number of cases of infection under 15 years of age as the findings would not be significant.

Cases of infection below 15 years of age

Infection of the nose

Ceylon: 37 or 48 per cent
Other countries: 10 or 23·2 per cent

Infection of the eye

Ceylon: 23 or 46 per cent

Infection of the nose and eye

Ceylon: 60 or 47·2 per cent
Other countries: 15 or 28·8 per cent
All countries: 75 or 41·9 per cent

A high percentage of infection (over 40 per cent) is seen in patients under 15 years of age. In Ceylon a slightly higher percentage of females under 15 years of age is seen in nasal infection than in eye infection; the percentage of cases of nasal infection in Ceylon is more than twice that in other countries.

Recurrences in single sites of infection

	Ceylon	*India*	*Iran*	*Malaya*	*United States*	*Belgian Congo*	*Italy*	*Total*
Nose	5	7	1	1	1	—	—	15
Eye	5	—	—	—	—	1	1	7
Nasopharynx	—	1	—	—	—	—		1
Total	10	8	1	1	1	1	1	23

Infection of the nose

Five out of 15 cases of recurrence were observed in Ceylon (33·3 per cent).

Infection of the eye

Five out of 7 cases of recurrence were observed in Ceylon (71·4 per cent).

Frequency of recurrences

Infection of the nose

	No. of cases		*Total number of recurrences*
Ceylon	5	Recurred once in 4 cases and twice in one case	6
India	7	Recurred once in 4, twice in 2 and eight times in 1	16
Malaya	1	Recurred twice	2
Iran	1	Recurred once	1
United States	1	Recurred twice	2
			27

Infection of the eye

Ceylon	5	Recurred once in 2 cases and twice in 3 cases	8
Belgian Congo	1	Recurred once	1
Italy	1	Recurred twice	2
			11

Eight of eleven recurrences, i.e. 72·7 per cent were observed in Ceylon

Nasopharynx

India	1	Recurred twice	2

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PART II

INFECTION IN THE MALE

As the disease is relatively common in males and has often been described, I shall limit my observations to cases that have been observed by us in Ceylon. Only infection of the nose or of the eye will be considered here; infection at rare or uncommon sites and of multiple sites are detailed in Parts III and IV.

For reasons of space I have not tabulated the cases of infection in the male as was done in the case of the female but merely summarized the anatomical, clinical and other findings and drawn attention to cases of special interest. The ratio of percentage of infection to percentage of population, the age distribution, duration of the disease and recurrences in the male have also been compared with those in the female. The geographical, racial and site distribution of cases of infection in males are tabulated in Part V.

	Infection of the nose		*Infection of the eye*		*Rare sites*		*Multiple sites*		*Total*	
	M	F	M	F	M	F	M	F	M	F
S.	159	64	94	41	17	9	9	2	279	116
M.	76	2	22	3	5	—	9	1	112	6
T. (C.)	57	13	16	6	1	—	—	1	74	20
T. (I.)	42	5	6	2	3	—	2	—	53	7
Mla.	7	1	1	—	—	—	1	—	9	1
Mly.	2	—	1	—	2	—	—	—	5	—
Ceylonese	1	—	—	—	—	—	—	—	1	—
	344	85	140	52	28	9	21	4	533	150

Infection of the nose and eye in the four major racial groups: S., M., T. (C.), T. (I.)

Nasal infection compared with eye infection

Incidence of nasal infection is higher than that of eye infection in males: the ratio is highest in the Indian Tamil (7 : 1); lowest in the Sinhalese (1 . 7 : 1).

In females too, the incidence is higher in nasal infection than in eye infection except in the case of the Muslim (·6 : 1). Among the other races the ratio is lowest in the Sinhalese (1·6 : 1) and highest in the Indian Tamil (2·5 : 1).

Incidence of the disease is higher in males than in females; highest ratio is found in infection of the nose in Muslim (38 : 1), lowest in the Sinhalese (nose 2·5 : 1; eye 2·3 : 1).

Infection of the nose and eye in males and females compared with the population percentage.

Infection in the Male

	Nasal Infection		*Percentage of population (1946 cases)*	Eye Infection	
	No. of sites	*Percentage*		*No. of sites*	*Percentage*
S.	159	46·2	68·5	94	67·1
M.	76	22·1	6·5	22	15·7
T. (C.)	57	16·6	10·8	16	11·4
T. (I.)	42	12·2	12·2	6	4·3
Mle.	7			1	
Mly.	2 } others	2·9	2·0	1 } others	1·4
Ceylonese	1			—	
	344	100·0	100·0	140	99·9

Ratio of site percentage to population percentage

	Nasal infection		*Eye infection*	
S.	.67 : 1	very low	.98 : 1	slightly low
M.	3.5 : 1	very high	2.4 : 1	very high
T. (C.)	1.5 : 1	high	1.1 : 1	slightly high
T. (I.)	1 : 1	same	.35 : 1	very low

Infection in Females

	Nasal infection		*Percentage of population*	*Eye infection*	
	Number	*Percentage*		*Number*	*Percentage*
S.	64	75·3	70·4	41	78·8
M.	2	2·3	5·8	3	5·8
T. (C.)	13	15·3	11·2	6	11·5
T. (I.)	5	5·9	11·2	2	3·8
Mle.	1	1·2	1·4	—	—
	85	100·0	100·0	52	99.9

Ratio of site percentage to population percentage

	Nasal infection	*Eye infection*
S.	1·07 : 1 high	1·1 : 1 high
M.	·4 : 1 very low (less than half)	1 : 1 same
T. (C.)	1·4 : 1 high	1·03 : 1 slightly high
T. (I.)	·53 : 1 very low (slightly more than half)	·34 : 1 very low (a little more than a third)

Percentage of infected sites compared with population percentage

Males

S.	Low in nasal infection—slightly low in eye infection
M.	Very high both in nasal and eye infection; higher in nasal infection than in eye infection
T. (C.)	High in both nasal and eye infection; higher in nasal infection than in eye infection
T. (I.)	Nasal infection—same as population percentage; in eye infection very low

Females

S.	High in both nasal and eye infection; higher in eye infection than in nasal infection
M.	Nasal infection very low; eye infection same as population percentage
T. (C.)	High in both nasal and eye infection; higher in nasal infection than in eye infection
T. (I.)	Low in both nasal and eye infection; lower in eye infection than in infection of the nose

Clinical characteristics

Infection of the nose

The clinical history of 195 cases is known. The presence of a growth was specifically mentioned in a relatively small number of cases. It has, however, to be presumed that many others were troubled with a growth though this fact has not been specifically stated by them. In 31 a growth alone was present. In 44 there were other signs or symptoms in addition: bleeding (10); blocking of the nose and obstruction to breathing (17); discharge (9); blocking of the nose and bleeding (4); blocking of the nose and discharge (1); bleeding and discharge (2). One complained of attacks of catarrh, bleeding and difficulty in breathing.

In the remaining cases the presence of a growth was not specifically mentioned. The complaints were: obstruction or blocking of the nose with difficulty in breathing in 51; bleeding in 20; discharge in 10. In 36 there was a combination of symptoms: blocking of the nose and bleeding in 18; blocking of the nose and discharge in 18. One complained of blocking of the nose and cough; another of epistaxis and frequent colds; a third of chronic catarrh, difficulty in breathing and epistaxis.

Apart from the presence of a growth, the commonest complaints are blocking of the nose with difficulty in breathing, bleeding and discharge. Blocking of the nose with difficulty in breathing was the sole complaint in 51, but in association with other symptoms such as bleeding, discharge, etc., it was seen in a further 59 cases. Thus in 56 per cent of the cases this was the main complaint. Bleeding by itself or in association with other symptoms was present in 57, and in 40 a discharge was present either by itself or with other symptoms.

The character of the bleeding was described in a few cases only; in two or three cases it was frequent or severe and in a few cases it was slight or occasional. In one instance the bleeding dated from childhood, that is, nearly thirty years. In most of the cases the discharge was described as blood-stained, in 2 cases as mucoid and in 1 case the discharge was purulent.

Infection of the eye.

A clinical history was available in 90 cases. In 53 cases the presence of a growth was the sole complaint. There was a history of injury in 5 of the cases. In 17 there were other symptoms in addition; irritation of the eye or a feeling of discomfort in 8; frequent flow of tears in 3; congestion of the eye in 2; a blood-stained discharge in 1. In 3 there was a combination of symptoms, viz. irritation and frequent tears, redness of the eye with lachrymation, irritation of the eye with inability to see the light. One patient complained of a painful growth.

The remaining 20 did not complain of growths. Four complained of a feeling of irritation; five, of frequent tears; two, of discharge, blood-stained in one and semi-purulent in the other; one complained of a red eye; the remaining 8 complained of a combination of symptoms: irritation and lachrymation (2); congestion of the eye with lachrymation (4);

congestion and irritation (1). One complained of a red eye with swelling and inability to see the light. It is worth noting that in infection of the eye, the presence of a growth either alone or in combination with other symptoms was present in nearly 78 per cent of the cases.

Age Incidence

Nasal Infection

Age group	S		M		T.C.		T.I.		Others		Total	
	M	F	M	F	M	F	M	F	M	F	M	F
0—14	30	33	5	1	10	3	1	2	—	—	46	39
15—39	103	26	54	1	38	5	32	2	8	1	235	35
40—94	17	2	11	—	7	5	3	1	1	—	39	8
	150	61	70	2	55	13	36	5	9	1	320	82

Eye Infection

Age group	S		M		T.C.		T.I.		Others		Total	
	M	F	M	F	M	F	M	F	M	F	M	F
0—14	33	18	3	1	7	2	1	—	1	—	45	21
15—39	25	12	9	1	2	1	1	2	1	—	38	16
40—94	32	10	8	1	5	1	3	—	—	—	48	12
	90	40	20	3	14	4	5	2	2	—	131	49

Infection of the nose. In males the highest incidence 73 cases (22·8 per cent) is in the age group 20—24; in females it occurs in the age group 10—14 (31 cases; 37·8 per cent). In the under—15 age group the percentage of females is 3·3 times as high as in males (females 39 or 47·5 per cent; males 46 or 14·3 per cent)

Infection of the eye. In both males and females the highest incidence is in the age group 10—14 (males 26 or 19·8 per cent; females 15 or 30·6 per cent). In the under—15 age group are 45 males (34·4 per cent) and 21 females (42·8 per cent). As in the case of nasal infection, a higher percentage of the female cases occurs in the lower age group, but for infection of the eye the female percentage is only 1·3 times that for the male.

Sites of Infection

The side affected in nose and eye infection

Site	Right	Left	Bilateral	Unspecified	Total
Nose	116	118	10	100	354
Eye	55	51	—	34	140

Location of lesions of the nose

No. of cases	Septum	Inferior turbinate	Nasal floor	Nasal roof	Middle turbinate	Middle meatus	Super	Total lesions
92 with single lesions	49	21	13	5	1	2	1	92
11 with multiple lesions	7	5	9	1	1	—	—	23

In infection of the nose the commonest sites of infection are the septum (53·3 per cent), inferior turbinate (22·8 per cent) and the nasal floor (14·1 per cent). These three sites make up a total of 99·2 per cent of infection in single sites. In the cases where multiple lesions occur, they are most commonly found in the nasal floor (39·1 per cent), inferior turbinate (30·4 per cent) and septum (21·7 per cent); 91·2 per cent of cases of multiple lesions occur at these three sites.

Location of lesions in infection of the eye

Total cases	*Lesions in lids*				*Lesions at other sites*					
	upper	*lower*	*un-specified*	*Total lids*	*Bulb*	*Limbus*	*Caruncle*	*Outer Canthus*	*Inner Canthus*	*Total sites*
140	37	22	72	131	7	—	—	—	3	141*

*Both the upper and lower lids were affected in one case

Duration of the infection (nose)

Race	*Months*						*Years*						*Total*
	½	2	4	6	8	10—12	1	2	4	6	8	10—12	
S. males	7	24	3	15	6	1	20	16	5	3	1	1	102
S. females	3	8	6	6	2	8	8	2	2	1	—	—	41
M. Males	2	8	—	7	4	—	15	13	1	4	—	3	57
T. (C.) males	4	5	5	6	1	1	9	4	—	—	—	—	35
T. (I.) males	—	5	3	6	1	1	4	6	2	2	2	—	32

In the above table I have not included, in the case of males, the Malayalee and the Malay, as there are only five of the former and two of the latter. In the case of females I have given the figures for the Sinhalese female only, as the number of females in the other races is too small, viz. Muslim 1; Ceylon Tamil 4; Indian Tamil 2.

Duration of the infection (eye)

Race	½	2	4	6	8	10	12	1 *year*	*Total*
S. males	8	21	13	10	2	4		3	61
S. females	6	15	2	5	1	3		—	32
M. males	1	1	5	8	3	—		—	18
T. (C.) males	1	4	2	6	1	—		—	14
T. (I.) males	—	—	3	1	—	—		1	5

I have excluded from the above table the duration in two males: 1 Malayalee and one Malay; and of eight females: 2 Muslims, 4 Ceylon Tamils and 2 Indian Tamils.

Duration of nasal and eye infection compared. Both males and females have a shorter average duration of infection of the eye than of the nose. The average for nasal infection is 19·7 months for males and 13·1 months for females, while for infection of the eye it is 4·7 months for males and 3·6 months for females.

The percentage of cases of nasal infection with a duration longer than one year is 30·5 per cent (seventy-one cases) for males and 18·4 per cent (nine cases) for females. For eye infection there are no recorded cases with a duration of more than a year.

Cases of nasal infection with a duration of under six months are found in 28·3 per cent of males (sixty-six cases) and in 47 per cent of females (twenty-three cases). For eye infection the figures are similarly higher in females where 70·6 per cent (twenty-four cases) have a duration of less than six months compared with 61 per cent of males (sixty-one cases).

Incidence in Sinhalese males compared with that in other races. Sinhalese males show a shorter average duration than males of other races both in infection of the eye and of the nose. For infection of the nose the average duration is 15·9 months in Sinhalese males compared with 22·7 months in males of other races and for eye infection 4·4 months compared with 5·1 months for males of other races.

A higher percentage of Sinhalese than other males have a duration of less than three months, both in infection of the nose and the eye. (Nose infection: Sinhalese males 11·6 per cent, others 9·2 per cent; Eye infection: Sinhalese males 22·5 per cent, others 12·8 per cent.).

Incidence in Sinhalese males and Sinhalese females compared. Sinhalese females show a shorter average duration than males both in infection of the nose and of the eye. For infection of the nose the average for females is 11·4 months, and for males 15·9 months; for infection of the eye the female average is 3·5 months, while for the male it is 4·4 months.

The percentage of females with a duration of under three months is 3·2 times higher in cases of infection of the nose (Sinhalese females 37·1 per cent, males 11·6 per cent) and 1·7 times higher in infection of the eye (Sinhalese females 50·0 per cent, males 29·5 per cent).

Recurrences in nasal and eye infection in the 4 major races; males and females compared

	Nasal infection in males			Nasal infection in females		
Race	*No. of cases*	*No. of recurrences*	*Ratio*	*No. of cases*	*No. of recurrences*	*Ratio*
S.	159	15	1 R. in 10.6 cases	64	3	1 R. in 21.3 cases
M.	76	14	1 R. in 5.4 cases	2	—	—
T. (C.)	59	7	1 R. in 8.1 cases	3	—	—
T. (I.)	42	12	1 R. in 3.5 cases	5	1	1 R. in 5 cases

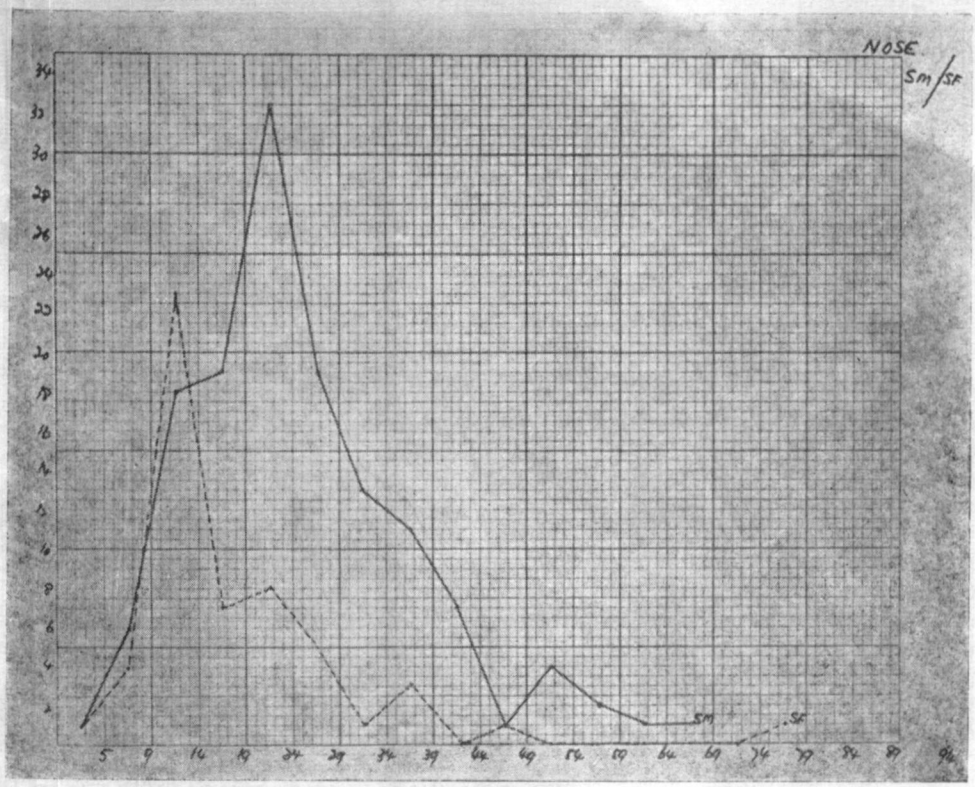
The highest ratio of recurrences in nasal infection (males and females) is in the Indian Tamil.

Infection of the eye

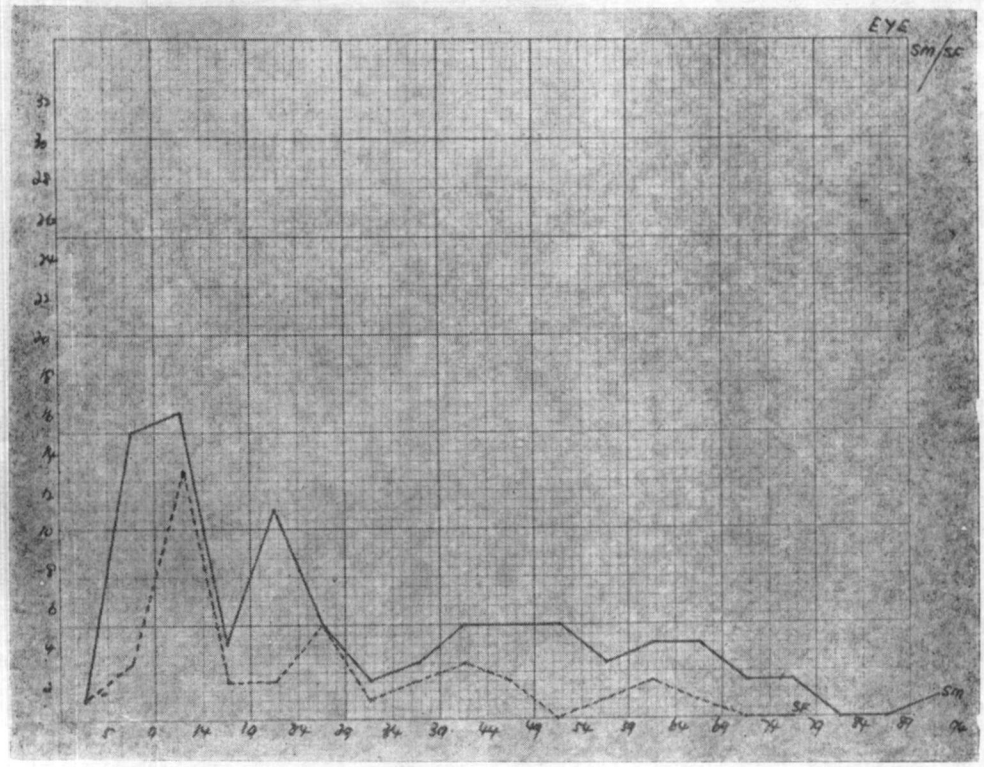
Recurrences seen only in the Sinhalese (males and females)

S. males 10 recurrences in 94 cases; ratio 1 R. in 9·4 cases

S. females 5 recurrences in 41 cases; ratio 1 R. in 8·2 cases



Graph 1. Nose: Sinhalese males and Sinhalese females. Both curves have the same slope. The peak for the females is form 9—14 and that of males 19—24.



Graph 2. Eye : Sinhalese males and Sinhalese females. The two curves are biphasic; in the S. males the first curve runs from 0—5 to 29—34 and the peak occurs at 19—24.

The second phase runs from about 34—39 to 78—84 with a peak at 49—54. Corresponding curve for the S. females is almost identical with the first part of the male curve, but the peak is about 5 years later and in the second part of the female curve the peak is about 10 years later.

Geographical and Racial Distribution

Infection of the nose in the male

Ceylon

Sinhalese 159; Moor 76; Ceylon Tamil 57; Indian Tamil 42; Malayalee 7; Malay 2
Ceylonese (race not known) 1

Other countries

Hindu	118	India	Thai	2	Thailand
Muslim	31	India	Iran	20	Iran
Christian	3	India	Vietnamese	1	Vietnam
Parsee	2	India	Malay	1	Malaya
Indian	109	India	Chinese	2	Malaya
Hindu	1	Pondicherry	Filipino	1	Philippines
Muslim	1	Pondicherry	South American white	1	South Africa (Union)
Indian	1	Palestine	Natalian	1	Natal
Indian	2	Vietnam	Rhodesian	1	Rhodesia
Indian	15	Malaya	Ugandan	1	Uganda
Indian	1	South Africa (Union)	Gouro	1	Ivory Coast
			Liberian	1	Liberia
Indian	3	England	Chinese	1	England
Indian	1	Italy	Englishman	1	England
Indian	1	Scotland	Russian	1	Russia
			Argentinian	13	Argentina
American white	12	United States	Uruguayan	3	Uruguay
American Negro	4	United States	Colombian	1	Colombia
Mexican	1	Mexico	Paraguayan	7	Paraguay
Guadeloupean	1	Guadeloupe	Venezuelan	1	Venezuela
			Brazilian	9	Brazil

Infection of the eye in the male

Ceylon

Sinhalese 94; Moor 22; Ceylon Tamil 16; Indian Tamil 6; Malayalee 1; Malay 1

Other countries

Hindu	6	India	Ugandan	1	Uganda
Muslim	3	India	South African white	1	England
Indian	28	India	Japanese	1	Switzerland
Indian	1	Surinam	American white	5	United States
Iranian	7	Iran	American Negro	1	United States
South African white	3	South Africa (Union)	Mexican	1	Mexico
South African native	3	„	Argentinian	2	Argentina
South African	1	„	Paraguayan	3	Paraguay
Zulu	1	„	Ecuadorian	1	Ecuador
Bantu	1	„	Colombian	1	Colombia
			Venezuelan	1	Venezuela
			Brazilian	4	Brazil

Infection at rare and multiple sites

Ceylon

Sinhalese 26; Moor 14; Ceylon Tamil 1; Indian Tamil 5: Malayalee 1; Malay 2

Other countries

Hindu	21	India	Vietnamese	3	Vietnam
Muslim	12	India	Indian	1	England
Indian	46	India	Italian	1	Italy
Indian	1	Malaya	Iranian	2	Iran
Indian	2	Indonesia	Malagasy	1	Madagascar
Indian	1	Scotland	American white	1	United States
Bolivian	1	Bolivia			

PART III

UNCOMMON OR RARE SITES OF INFECTION

Sites of Infection	*India*		*Sex not known*	*Ceylon*		*Other countries*			*Total*
	M	*F*		*M*	*F*	*M*	*F*		
Nasopharynx	11	2	43	14	5	—	—		75
Palate (Unspecified)	—	—	2	—	—	—	—		2
Soft Palate	—	—	—	3	—	—	—		3
Uvula	1	—	2	—	—	—	—		3
Mucus membrane of mouth	—	—	—	1	—	—	—		1
Hard Palate	—	—	—	1	—	—	—		1
Oropharynx	2	—	—	—	—	—	—		2
Tonsil	—	—	1	—	1	1	1	United States	4
Throat	—	—	—	—	—	1	—	Vietnam	1
Epiglottis	—	—	1	—	—	—	—		1
Larynx	1	—	2	—	—	—	—		3
Maxillary Antrum	—	—	4	—	—	—	—		4
Lachrymal Sac	14	2	15	5	2	—	—		38
Parotid	1	—	—	1	—	—	—		2
Scalp	—	1	—	—	—	—	—		1
Face	—	—	1	—	—	—	—		1
Lip	1	—	—	—	—	—	—		1
Abdomen	—	—	—	—	—	—	1	Brazil	1
External Ear	—	—	—	—	—	1	—	England	1
Multiple Skin	1	—	1	—	—	—	—		2
Eustachian tube (inner end)	—	—	—	1	—	—	—		1
Cerebral cyst	—	—	—	—	—	1	—	Italy	1
Glans penis	1	—	—	1	—	—	—		2
Urethra	1	—	3	1	—	1	—	Indonesia	6
Vagina	—	—	—	—	1	—	—		1
Vulva	—	—	—	—	—	—	1	Argentina	1
Rectum	—	—	—	—	—	1	—	Malaya	1
Total	34	5	75	28	9	6	3		160

A total of 160 cases have been recorded. Sex known in 85: M.68, F. 17, i.e. ratio 4:1; sex not known in 75.

In a total of 1780 known sites of infection, rare or uncommon sites form 9 per cent.

The largest number has been reported from India, viz. 114 (34 M, 5 F, sex not known in 75). Ceylon has reported the second largest number, viz. 37 (M. 28, F. 9). Nine cases have been reported from the remaining countries.

The commonest site is the nasopharynx = 75 or 46·9 per cent. Next common site is the lachrymal sac = 38 or 23·75 per cent.

These two sites were affected in more than 70 per cent. The other 25 sites were involved in less than 30 per cent of the cases.

In the case of certain sites, only one case of infection has been recorded.

Males: Hard palate, mucous membrane of the mouth; epiglottis, throat, skin of face, lip, external ear, inner end of Eustachian tube, brain, rectum
Females: Skin of scalp, skin of abdomen, vagina, vulva.

Infection at less common or rare sites

Year	*Sex*	*Race*	*Age*	*Site of infection*	*Details and Comments.*
1924	M	S	8	Left lachrymal sac	
1927	M	M	45	Front of soft palate	Rhinosporidiosis associated with squamous carcinoma
1930	M	M	—	Nasopharynx	—
1932	M	T(I)	44	Back of soft palate	Growth appeared below free edge of soft palate
1934	M	M	32	Nasopharynx	Difficulty in breathing
1936	M	Mly	29	Nasopharynx	Blow on nose two years ago
1938	F	S	8	Vagina	The parts were congested, there was a sanious discharge
1938	M	S	8	Left lachrymal sac	Discharge in which R.spores were observed
1939	M	T(I)	23	Right lachrymal sac	Nodule started 10 years ago; operated 5 years later: a second operation 2 years ago
1941	M	M	27	Nasopharynx	Nasal obstruction 6 years ago; growth disappeared; growth recurred with obstruction to breathing during the last 2 years
1943	M	Mly	39	Nasopharynx	Difficulty in articulation of voice; nasal obstruction
1943	F	S	9	Right lachrymal sac	Swelling with discharge of blood and pus
1944	M	S	19	Nasopharynx	Swallowing difficult
1948	M	S	53	Hard palate	—
1948	M	S	43	Nasopharynx	Difficulty in breathing
1951	M	S	28	Urethra	A pedunculated growth with a long pedicle and bulbous end. Pedicle was attached inside the urethra but its point of attachment could not be seen. The bulbous end was about the size of a pepper seed and projected out of the urethral orifice. The exposed surface was smooth and pinkish in colour; there was no ulceration. Patient noticed growth about 2 weeks back; no interference with micturition. The growth was not painful; no history of trauma.

1951	F	S	9	Tonsil	Both tonsils were enlarged; Rhinosporidium spores found in one only
1951	F	S	22	Nasopharynx	Condition diagnosed as one of nasopharyngeal fibroma
1951	F	S	40	Nasopharynx	Blood-stained discharge; growth seen in throat
1951	M	S	52	Left lachrymal sac	About 2 years ago a swelling appeared; 6 months later it was operated upon; about a month after the operation there was a recurrence; this was operatively removed; a second recurrence was removed some months later; flow of tears but no discharge.
1951	F	S	30	Nasopharynx	Difficulty in breathing
1952	M	S	25	Nasopharynx	Bleeding; obstruction to breathing later
1952	M	S	23	Nasopharynx	Nasal obstruction and blood-stained discharge
1953	M	S	35	Nasopharynx	Growth seen in throat; swallowing difficult
1955	M	S	42	Parotid gland	Noticed hard nodule in left cheek; discharge of saliva on pressing lump; it increased in size during meals; on squeezing it there was at times a blood-stained discharge. The nodule was about 1 cm in diameter and was situated about one inch posterior to the opening of the parotid duct. There were patches of leukoplakia on mucosal surface of cheek. At operation a friable fleshy lump like a strawberry was scooped out. It was not adherent to the surrounding tissues.
1955	M	T(I)	21	Nasopharynx	Nasal obstruction; cough. There was one previous operation.
1955	M	S	65	Soft palate	Irritation in throat; cough
1955	M	S	40	Orifice of left Eustachian tube	15 years duration; irritation in throat and cough
1955	M	T(C)	48	Nasopharynx	Breathing difficult; blood-stained discharge
1956	M	S	40	Left lachrymal sac	Swelling; excessive tears
1957	F	S	26	Nasopharynx	Breathing difficult
1959	M	S	21	Nasopharynx	Nasal discharge 1½ years ago; a lump appeared at the back of the throat about 7 months ago; difficulty in swallowing
1959	F	S	30	Nasopharynx	Breathing difficult
1962	F	S	40	Left lachrymal sac	History of lump below the left eye of 5 years' duration; this gradually increased; on pressing lump the patient experienced a salty taste in the mouth; at operation a polypoid growth was removed.
1962	M	M	65	Glans penis	A soft cauliflower-like growth on glans penis which has gradually increased in size during the last 15 years; occasional dysuria
1963	M	S	37	Mucous membrane of cheek ; started at angle of mouth	—
1963	M	S	22	Nasopharynx	Difficulty in breathing

Rhinosporidiosis at uncommon or rare sites recorded in other countries

Author and Year		*Country*	*Details and commentary*
Beattie	(1907)	England	External ear; specimen sent by Dr. Nair from India.
Ingram	(1910)	India	Glans penis; a cauliflower-like growth of size of a baby's fist in Muslim male
Tirumurti	(1914)	India	2 cases of infection of nasopharynx in males
Kirkpatrick	(1916)	India	Lachrymal sac (male); the nose was affected later.
Warthin	(1930)	United States	2 cases of infection of the tonsil in American male and female.
Wright and Tirumurti	(1922)	India	Recorded case of rhinosporidiosis of the uvula observed by Chinaswamy Pillai.
Ruiz and Ocana	(1930)	Argentina	A case of cerebral cyst observed by Parodi in Italy; mentioned by Alessandrini at Congress of Medicine at Buenos Aires
Kurup	(1931)	India	Nasopharynx (female)
Dhayagude	(1941)	India	Urethra; a small polypoid growth resembling the bifid tongue of a serpent protruded from urethral orifice in Muslim male aged 45; multiple tumours on skin of face, thorax, abdomen, back and upper extremities in Hindu male; the nose was not affected.
Rambo	(1949)	India	8 cases of infection of the lachrymal sac; two males and a female, but no indication of sex in the other five
Cherian and Satyanarayana	(1949)	India	Skin of scalp in female
Borzone *et al.*	(1951)	Argentina	Infection of the vulva
Amesur	(1951)	India	Infection of the maxillary antrum
Institute for Medical Research, Kuala Lumpur	(1951)	Malaya	Rectal growth in an Indian boy
Mahadevan	(1952)	India	Parotid salivary cyst (male)
Purandare and Deoras	(1953)	India	Lachrymal sac (2 males); lip (male); larynx (male); nasopharynx (3 males)
Reddi	(1954)	India	nasopharynx (24); lachrymal sac (10); antrum (3); urethra (3); larynx (2); face (1); uvula (1); soft palate (1)
Coutinho	(1955)	Brazil	Skin of abdomen of female aged 83 years
Tjokronegoro *et al.*	(1955)	Indonesia	Urethra (male); Indian who up to ten years previously had lived in India. There were 3 small nodules in right wall of urethral orifice; two nodules in left wall just opposite had been removed two years previously.
Henry	(1958)	India	Nasopharynx (4); the patients had been previously operated upon for growth in the nose.
Nguyen-Van Ai *et al.*	(1958)	Vietnam	Back of throat (male)
Vellore Christian Medical College Hospital Records	(1958)	India	Nasopharynx (female)
Satyanarayana	(1960)	India	Nasopharynx (15); epiglottis (1); palate (1); tonsil (1)
Subramanyam and Ramana Rao	(1960)	India	Nasopharynx (6 males); lachrymal sac (4 males); oropharynx (2 males)
Sharma *et al.*	(1962)	India	Skin; nodules widespread all over the body but mainly on the extremities; no lesion in the nose or nasopharynx. They state that in 48 cases the nose or nasopharynx was the seat of infection.
Kuriacose	(1963)	India	Infection of the lachrymal sac; 6 cases (5 males and 1 female)

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PART IV

INFECTION AT MORE THAN ONE SITE

Two Sites

Sites of Infection	*India*		*Ceylon*		*Other Countries*			*Total*	
	M	*F*	*M*	*F*	*M*	*F*		*M*	*F*
Nose and nasopharynx	17	1	12	—	1	—	Scotland	30	1
Nose and skin	3	—	1	2	1	—	Bolivia	5	2
Nose and lachrymal sac	3	—	1	—	—	—		4	—
Nose and antrum	1	1	—	—	2	—	Indonesia Vietnam	3	1
Nose and eye	2	—	—	1	2	—	Iran	4	1
Nose and oropharynx	—	—	2	—	—	—		2	0
Nose and soft palate	—	—	—	1	—	—		—	1
Trachea and soft palate	1	—	—	—	—	—		1	—
Lachrymal sac and eye	—	—	1	—	—	—		1	—
Lachrymal sac and antrum	—	—	1	—	—	—		1	—
Soft palate and nasopharynx	—	—	1	—	—	—		1	—
Nose and fauces	—	1	—	—	—	—		—	1
Eye and skin	1	—	—	—	—	—		1	—

Nose and trachea	1	—	—	—	—	—		1	—
Nose and upper lip	1	—	—	—	—	—		1	—
Eye and throat	—	—	—	—	1	—	Madagascar	1	—
Lachrymal sac and duct	1	—	—	—	—	—		1	—
	31	3	19	4	7	—		57	7

One case of infection of the nose and eye and two cases of infection of the nose and skin were recorded by Sharma *et al.* (1962) but sex was not definitely indicated.

Three Sites

	India		*Ceylon*		*Other Countries*			*Total*	
	M	*F*	*M*	*F*	*M*	*F*		*M*	*F*
Nose, nasopharynx and skin	1	—	—	—	—	—		1	—
Nose, nasopharynx and lachrymal sac	3	—	—	—	—	—		3	—
Nose, skin and lachrymal sac	1	—	—	—	—	—		1	—
Nose, nasopharynx and oropharynx	—	—	1	—	—	—		1	—
Nose, nasopharynx and eye	—	—	1	—	—	—		1	—
Nose, skin and bone	—	—	—	—	1	—	Vietnam	1	—
	5	—	2	—	1	—		8	—

Four Sites

All five cases reported from India

	M	*F*
Nose, nasopharynx, larynx and skin (Allen and Dave, 1936)	1	—
Lachrymal sac, eyelid, nasopharynx and skin (Swamy and Das Gupta, 1956)	1	—
Nose, nasopharynx, bronchus and left lachrymal sac (Thomas *et al.*, 1956)	1	—
Nose, tonsils, uvula and pillars of fauces (Cherian and Satyanarayana, 1949)	—	1
Nose, larynx, palate and skin (Lahiri, 1957—1958)	1	—
	4	1

More than four sites

All five cases reported from India

	M	*F*
Nose, tonsils, soft palate, trachea and bronchus (Subramanyam *et al.*, 1960)	1	—
Nose, nasopharynx, fauces, epiglottis and skin (Desmond, 1953)	1	—
Nose, palate, epiglottis, larynx and skin (Satyanarayana, 1960)	1	—
Nose, skin, kidney, myocardium, spleen, brain, pancreas, liver, blood, etc. (Rajam *et al.*, 1955)	1	—
Eyelid, tongue, epiglottis, vocal cords, lungs, liver, spleen, kidney and multiple skin lesions (Agarwal *et al.*, 1959)	1	—
	5	—

Infection at more than one site

In 1780 cases where the site of infection is known, infection at more than one site was recorded in 103 or 5.7 per cent.

In 82 cases the sex is known (74 M. 8 F; ratio 9:1). Sex not explicitly stated in 21

Distribution of site incidence

2 sites in 67 or 78·8 per cent
3 sites in 8
4 sites in 5
More than 4 sites in 5

In 18, infection of the nose was associated with infection at one or more other sites.

The nose and nasopharynx were affected in	40
The nose only in	54
The nasopharynx only in	2

Hence the nose, nasopharynx or both were involved in 96 cases; that is, 93.2 per cent, demonstrating the predilection of the organism to affect this part of the body

INFECTION AT MORE THAN ONE SITE

Year	*Sex*	*Race*	*Age*	*Site of infection*	*Details and comments*
1928	M	S	24	Left nose and nasopharynx	Polypoid masses in left nostril and nasopharynx
1929	M	S	- -	Left nose and nasopharynx	Frequent attacks of catarrh; difficulty in breathing
1929	M	M	45	Nose and nasopharynx	Growth in both nostrils and in nasopharynx; 2 previous operations; difficulty in breathing
1933	M	M	- -	Nose and nasopharynx	Difficulty in breathing
1933	M	M	47	R.nostril and nasopharynx	Growth in nose about 1 year; growth in throat since 9 months. Difficulty in breathing and swallowing
1933	M	M	25	Nose, nasopharynx and wall of pharynx	Difficulty in breathing and swallowing
1934	M	M	37	Left nostril and nasopharynx	Difficulty in swallowing; epistaxis; one previous operation
1934	M	Mle	35	Left lachrymal sac and antrum	Swelling; growth in antrum. The lachrymal sac growth had recurred for the 3rd time. At operation there was a tail-like portion of the growth which passed down the nasal duct and appeared behind the soft palate
1934	M	S	23	Growths in left nostril and pharynx	2 previous operations for the removal of nasal growths
1936	M	S	45	Soft palate and nasopharynx	Several previous operations; the first operation about 20 years ago; three operations since
1937	M	M	38	Nose and nasopharynx	Duration 10—12 years; 6 previous operations
1938	M	M	32	Left nostril, nasopharynx and bulb of left eye	Severe nasal obstruction; growth protruded from nostril; more than 12 operations had been performed within the last eighteen years; the growth on the bulb appeared about 6 months back. He stated that each operation diminished the interval before the next operation
1939	M	S	82	Left upper eyelid and left lachrymal sac	Growth seen in lachrymal sac about a month after the eyelid growth was noticed. The age of the patient is worth noting. Diffuse swelling over the lachrymal sac area and a small growth under the left upper eyelid

1590	F	S	28	Right nostril and skin over the right ala nasi	At operation it was found that the skin growth was an extension of the growth from within the nasal cavity
1952	M	T(I.)	63	Left nostril and nasopharynx	Difficulty in breathing for the last 5 years; had been operated on previously about 6—7 years ago for a growth in the nose
1954	M	T(I.)	24	Left nostril and nasopharynx	Breathing and swallowing difficult; previous operation one year ago
1956	M	S	55	Left nostril and skin below right eyelid	There had been a previous operation on the nose; a growth was seen on the skin below the right eyelid
1957	M	S	30	Left nostril and nasopharynx	Blocking of nose; blood-stained discharge; a growth was removed from the left nostril about 3 years ago
1959	F	S	17	Growth in left nostril; earlier growth at inner canthus of eye	About 3 years ago the patient was operated for a growth at the inner angle of the left eye
1959	M	S	65	Nose and naso-pharynx	Difficulty in breathing
1959	M	M	28	Right nostril and left side of wall of pharynx	One previous operation
1959	F	M	35	Growths in left nostril and back of soft palate	Previous operation on the nose in 1953
1960	M	M	39	Nose and lachry-mal sac	Growths in both nostrils and in left lachrymal sac. The nasal trouble started about 12 years ago; there was one previous operation. The lachrymal sac growth is of about 6 years' duration; there was a blood-stained discharge from the nose
1963	F	T(L.)	30	Nose and skin	Bleeding from nose; operation 15 months ago. Warty growth on skin of outer aspect of right upper arm about 6 inches above elbow; duration 3 months. A similar warty growth on skin of right upper arm just above elbow joint was excised 6 months ago.
1963	M	S	50	Nose and naso-pharynx	Growths in both nostrils and nasopharynx; breathing extremely difficult; nasal discharge

RHINOSPORIDIOSIS AT MULTIPLE SITES REPORTED IN OTHER COUNTRIES

Author	*Year*	*Country*	*Details and comments*
Elliot and Ingram	(1912)	India	Growths on left lower lid and on the skin below the free border of the same lid in a Muslim male
Tirumurti	(1914)	India	Nose and nasopharynx in a male
Wright	(1922)	India	Nose and lachrymal sac (male)
Ashworth	(1923)	Scotland	Infection of nose and nasopharynx in Indian medical student from Cochin; had the infection for over 10 years; repeated recurrences
Forsyth	(1924)	India	Granulomatous masses on skin of left face and occiput in a Muslim male; previously suffered from a tumour in the left nostril which had spontaneously disappeared; swelling of the left lachrymal sac probably rhinosporidial in origin

Norrie	(1929)	India	Muslim male with extensive involvement of the mucous membrane of the left nostril as well as of the skin at the left nasal orifice; had been operated upon five or six times previously
Cherian and Vasudevan	(1929)	India	Nasopharyngeal tumour in female with small independent growth in left posterior pillar of the fauces. Nasal growth had recurred despite 10 operations in 15 years.
Rao and Rao	(1931)	India	Growths in left upper eyelid and in both nostrils in a Moplah male
Allen and Dave	(1936)	India	(1) nose and skin (male), with multiple tumours on the skin; (2) nose and nasopharynx in 2 males; (1) nose and nasopharynx (female); (1) nose, nasopharynx and skin (male); (1) nose, nasopharynx, larynx and skin (male)
Habibi	(1944)	Iran	Infection of nose and eye in two Iranian males
Cherian and Satyanarayana	(1949)	India	Lesion in trachea in a male a long time after nasal infection; a female with infection of the nose, tonsils, pillars of the fauces and uvula
Desmond	(1953)	India	A male with infection of both nasal cavities, nasopharynx, right and left fauces, epiglottis and skin; six previous operations
Purandare and Deoras	(1953)	India	4 cases of infection of the nose and nasopharynx in males
Ferrand and Destombes	(1955)	Vietnam	Infection of right nasal cavity and maxillary antrum in a male previously resident in Pondicherry
Rajam *et al.*	(1955)	India	Hindu male aged 40 with long-standing nasal lesion; subsequent development of multiple cutaneous, subcutaneous and intermuscular tumours involving trunk, face and limbs; spores identified in blood, ascitic fluid and liver biopsy. Spores were found at autopsy widely distributed in organs and tissues: kidney, myocardium, spleen, pancreas, brain, etc.
Swamy and Das Gupta	(1956)	India	Male aged 55 who, at the age of seven, developed lesion of left inner canthus following trauma with black eye diagnosed as dacryocystitis. Subsequent rhinosporidiosis; growth in lachrymal region recurred twice followed by general dissemination with multiple lesions in the skin. The lower limbs were mainly affected
Hazra and Misra	(1956)	India	A case of infection of the lachrymal sac and nasolachrymal duct (male)
Schmidt	(1956)	Bolivia	Extensive growth in a Bolivian male extending from nostril to cover upper lip; two small nodules in left cheek
Thomas *et al.*	(1956)	India	Case with multiple sites of infection and first recorded with lesion in bronchus in male aged 31. Growths were found in both nostrils, nasopharynx and left lachrymal sac. Rhinosporidium spores were found in sputum. Examination of resected lower lobe revealed granulomatous lesion adherent to mucosa and ulceration of the epithelium in places. Sporangia were found extending deep down into the submucosa almost up to the cartilage
Lahiri	(1957—58)	India	Nose and upper lip (male); nasal infection with infiltration of palate, larynx and skin (male)
Henry	(1958)	India	Multiple growths in the skin of Hindu male following the removal of a recurrent nasal growth 15 years previously
Moeljono	(1958)	Indonesia	Infection of left nostril and left maxillary sinus in Indian born in Indonesia

Vellore Christian Medical College Hospital Records	(1958)	India	Infection of the nose and nasopharynx in 9 males; nose and lachrymal sac (male); nasopharynx and lachrymal sac (3 males); nose and antrum infection in a female; multiple growths in upper respiratory and alimentary pathways (male)
Subramaniam	(1958)	India	Infection of the right nasal cavity and antrum in Muslim male aged 39
Nguyen-Van-Ai *et al.*	(1958) (1959)	Vietnam	A nasal growth which covered the upper lip and completely obstructed the right nasal fossa; infection of bone in the right wrist and left foot; bone replaced by growth at the wrist and complete autolysis of the distal epiphysis of the 3rd metatarsal bone of the left foot
Brygoo *et al.*	(1959)	Madagascar	Infection of the eye and throat in a Malagasy 29 years of age. First report of rhinosporidiosis in Madagascar
Agarwal *et al.*	(1959)	India	Generalised rhinosporidiosis with visceral involvement. The nasal passages were free; disseminated nodules on cheek, back, lower extremities and scalp; nodules were also seen in the lungs anp upper respiratory tract, in palate, posterior part of tongue, epiglottis and both vocal cords. The epitrochlear and inguinal glands were also en. larged. Spores were identified in numerous sites such as liver, spleen and kidney (male).
Grewal and Ranjam	(1959)	India	Male aged 35; acute respiratory distress due to tumour arising from soft palate and projecting into pharynx; there was a growth in the trachea as well.
Satyanarayana	(1960)	India	Records 19 cases where infection of the nose was associated with infection at some other site: trachea (1); larynx (3); epiglottis (2); uvula (3); lachrymal sac (3); tonsil (1); maxillary antrum (2); skin (3). He also records a case of extensive rhinosporidiosis involving the nose, palate, epiglottis, larynx and skin; duration 30 years but no one of his family was infected.
Subramanyam and Ramana Rao	(1960)	India	A fatal case of tracheobronchial rhinosporidiosis with growths in the trachea and blocking of lumen at the orifice of the right stem bronchus; growths were also found in both nostrils, soft palate and tonsils. The patient was a Malayalee male aged 30 years.
Lakshmipath and Subba Rao	(1961)	India	Bilateral infection of the nose; nodules of growth were also seen in the roof and left lateral wall of the nasopharynx.
Sharma *et al.*	(1962)	India	Three cases where infection of the nose was associated with infection of the eye in one case and infection of the skin in two cases.
Kuriacose	(1963)	India	Infection of the nose and eye in a male. The upper and lower lids and bulbar conjunctiva were infiltrated with the organism; had the infection for 20 years.

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PART V

HUMAN RHINOSPORIDIOSIS

Site and sex incidence

In the literature are recorded at least 1940 cases of human rhinosporidiosis. These consist of A. 1295 cases where the sex and the site of infection are known (Table 1). B. groups of cases where although the sex and the sites of infection of the whole group are mentioned, there is no definite indication of the sex and site infected in each individual case (TableII).

B. TABLE II.

		Total cases	*Sex*		*Sites of infection*			*Infection of more than one site*
			M	*F*	*Nose*	*Eye*	*Rare sites*	
Satyanarayana	(1960)	254	204	50	217	—	19	18
Reddi	(1954)	156	139	17	100	11	45	—
Henry	(1958)	32	17	15	28	—	4	—
Sharma *et al.*	(1962)	55	49	6	48*	3	1	3
		497	409	88	393	14	69	21

48* nose or nasopharynx.

C. Cases in which the sex is mentioned but not the site

		M	*F*
Cherian and Satyanarayana	(1948)	60	10
Ferrand and Destombes	(1955)	1	—
		61	10

D. Cases where the site is indicated but not the sex

			Nose	*Eye*	*Rare site*	*Multiple sites*
Rambo	(1949)	.....	—	—	5	—
Amesur	(1951)	.....	—	—	1	—
Nair (cited by Ashworth)	(1923)	.....	4			
Noronha	(1933)	.....	10			
Bayer	(1954)	.....	14			
South African Institute Med. Research	(1959)	.....	1			
Med. Research	(1960)	.....		1		
			29	1	6	—

E. Cases where neither the site nor the sex is mentioned

		No. of cases
Hazra and Misra	(1956)	15
Swamy and Das Gupta	(1956)	5
Kurup	(1931)	6
Sahai	(1938)	3
Shrewsbury	(1933)	2
Allen	(1948)	7
Smith	(1949)	2
Navani and Tiagi	(1957)	1
		41

The following observers have encountered single cases or groups of cases of which no details are available: Evans (quoted by O'Kinealy, 1903), Kelly (quoted by O'Kinealy, 1904), Noronha (quoted by Allen and Dave, 1936), Ingram (1910), and several others. These have not been included in the total given above.

I have not been able to have access to the following publications; hence any cases mentionod therein are not included.

Irigoyen, Freyre and Barale (1947).
Pianzola, L. E., Pozzi Sergio, and Cordiviola, J. C. (1954).
Stachowsky, L. (1961).
Keiber, H. F. (1962).
Mieres, A., and Rathauser, W. (1962).

Since the above tables were compiled, cases of infection have been reported in the following publications:

Kutty *et al.* 1963. *Amer. J. Med. Sci.*, **245**, 695.
Dube *et al.* 1964. *J. Ind. Med. Assoc.*, **42**, 59.

These have not been included.

	Total Cases
(A)	1,295
(B)	497
(C)	71
(D)	36
(E)	41
	1,940

Sites of infection

	Nose	*Eye*	*Uncommon or rare sites*	*Infection at more than one site*	*Total*
A.	850	278	85	82	1295
*B.	345	14	69	21	449
D.	29	1	6	—	36
	1224	293	160	103	1780

*In 48 cases the site of infection is given as nose or nasopharynx.

Percentage of infection

Nose	68.8
Eye	16.5
Rare site	9.0
Infection at more than one site	5.7
	100.0

Sex incidence

	M	*F*	
A.	1079	216	
B.	409	88	
C.	61	10	
	1549	314	Sex not known in 77 (D & E).

Ceylon compared with other countries: sex and site incidence

	N		*E*		*Uncommon sites*		*Multiple sites*		*Total*	
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*
All countries	721	129	216	62	68	17	74	8	1079	216
Ceylon	344	85	140	52	28	9	21	4	533	150
Other countries	377	44	76	10	40	8	53	4	546	66

Ratio of males to females

	All sites		*Ratio M : F*
	M	*F*	
Ceylon	533	150	3.6 : 1
Other countries	546	66	8.3 : 1

Nose

	M	*F*	
Ceylon	344	85	4 : 1
Other countries	377	44	8.6 : 1

Eye

	M	*F*	
Ceylon	140	52	2.7 : 1
Other countries	76	10	7.6 : 1

Ratio of Nasal infection to Eye infection

Males

	N	*E*	
Ceylon	344	140	2.6 : 1
Other countries	377	76	5 : 1

Females

Ceylon	85	52	1.6 : 1
Other countries	44	10	4.4 : 1

A TABLE I

Geographical Distribution

ASIA

	Nose		*Eye*		*Uncommon or rare sites*		*Multiple sites*				*Total*
	M	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M*	*F*	*M&F*
India	263	21	37	4	34	5	45	4	379	34	413
Ceylon	344	85	140	52	28	9	21	4	533	150	683
Pondicherry	2	1	—	—	—	—	—	—	2	1	3
Malaya	18	1	—	—	1	—	—	—	19	1	20
Indonesia	—	—	—	—	1	—	1	—	2	—	2
Siam	2	—	—	—	—	—	—	—	2	—	2
Vietnam	3	—	—	—	1	—	2	—	6	—	6
Iran	20	13	7	—	—	—	2	—	29	13	42
Palestine	1	—	—	—	—	—	—	—	1	—	1
Philippines	1	—	—	—	—	—	—	—	1	—	1
Asia	654	121	184	56	65	14	71	8	974	199	1173

AFRICA

Union of South Africa	2	—	9	—	—	—	—	—	11	—	11
Natal	1	—	—	—	—	—	—	—	1	—	1
Rhodesia	1	—	—	—	—	—	—	—	1	—	1
Uganda	1	—	1	1	—	—	—	—	2	1	3
Belgian Congo	—	—	—	3	—	—	—	—	—	3	3
Ivory Coast	1	—	—	—	—	—	—	—	1	—	1
Liberia	1	—	—	—	—	—	—	—	1	—	1
Madagascar	—	—	—	—	—	—	1	—	1	—	1
Africa	7	—	10	4	—	—	1	—	18	4	22

EUROPE

England	5	—	1	—	1	—	—	—	7	—	7
Scotland	1	—	—	—	—	—	1	—	2	—	2
Italy	1	—	—	1	1	—	—	—	2	1	3
Turkey	—	1	—	—	—	—	—	—	—	1	1
Switzerland	—	—	1	—	—	—	—	—	1	—	1
Russia	1	—	—	—	—	—	—	—	1	—	1
Europe	8	1	2	1	2	—	1	—	13	2	15

NORTH AND CENTRAL AMERICA

United States	16	2	6	1	1	1	—	—	23	4	27
Mexico	1	—	1	—	—	—	—	—	2	—	2
Cuba	—	1	—	—	—	—	—	—	—	1	1
	17	3	7	1	1	1	—	—	25	5	30

SOUTH AMERICA

Argentina	13	3	2	—	—	1	—	—	15	4	19
Uruguay	3	—	—	—	—	—	—	—	3	—	3
Paraguay	7	—	3	—	—	—	—	—	10	—	10
Ecuador	—	—	1	—	—	—	—	—	1	—	1
Belivia	—	—	—	—	—	—	1	—	1	—	1
Colombia	1	—	1	—	—	—	—	—	2	—	2
Venezuela	1	—	1	—	—	—	—	—	2	—	2
Brazil	9	1	4	—	—	1	—	—	13	2	15
Surinam	—	—	1	—	—	—	—	—	1	—	1
	34	4	13	—	—	2	1	—	48	6	54

SUMMARY

Asia	654	121	184	56	65	14	71	8	974	199	1173
Africa	7	—	10	4	—	—	1	—	18	4	22
Europe	8	1	2	1	2	—	1	—	13	2	15
North and Central America	18*	3	7	1	1	1	—	—	26	5	31
South America	34	4	13	—	—	2	1	—	48	6	54
	721	129	216	62	68	17	74	8	1079	216	1295

*One case from Guadeloupe has been included.

Geographical and Racial Distribution

Males

Race		*Country*	*Race*		*Country*
Sinhalese	279	Ceylon	Japanese	1	Switzerland
Moor	112	Ceylon	Chinese	2	Malaya
C. Tamil	74	Ceylon	Chinese	1	England
I. Tamil	53	Ceylon	English	1	England
Malayalee	9	Ceylon	Rumanian	1	Rumania
Malay	5	Ceylon	Italian	1	Italy
* Ceylonese	1	Ceylon	Italian	1	Argentina
† Indian	180	India	Italian	1	Uruguay
Hindu	145	India	American white	18	United States
Muslim	46	India	American Negro	5	United States
Eurasian	3	India	Mexican	2	Mexico
Christian	3	India	Guadeloupean	1	Guadeloupe
Parsee	2	India	Argentinian	14	Argentina
Hindu	1	Pondicherry	Uruguayan	2	Uruguay
Muslim	1	Pondicherry	Paraguayan	10	Paraguay
Indian	1	Palestine	Brazilian	13	Brazil
Indian	2	Vietnam	Venezuelan	2	Venezuela
Indian	2	Indonesia	Ecuadorian	1	Ecuador
Indian	16	Malaya	South African white	4	South Africa (Union)
Indian	1	South Africa (Union)	South African native	3	South Africa (Union)
Indian	4	England	*South African	1	South Africa (Union)
Indian	2	Scotland	Zulu	1	South Africa (Union)
Indian	1	Italy	Bantu	1	South Africa (Union)
Indian	1	Surinam	South African white	1	England
Thai	2	Thailand	Gouro	1	Ivory Coast
Vietnamese	4	Vietnam	Malagasy	1	Madagascar
Iranian	29	Iran	Liberian	1	Liberia
Malay	1	Malaya	Natalian	1	Natal
Filipino	1	Philippines	Rhodesian	1	Rhodesia
			Ugandan	2	Uganda

* Race not known.

Females

Race		*Country*
Sinhalese	116	Ceylon
Moor	6	Ceylon
Ceylon Tamil	19	Ceylon
Indian Tamil	8	Ceylon
Malayalee	1	Ceylon
†Indian	24	India
Muslim	2	India
Hindu	8	India
Hindu	1	Pondicherry
Indian	1	Malaya
Italian	1	Italy

Turkish	1	Turkey
American white	3	United States
Austrian	1	United States
Cuban	1	Cuba
Argentinian	4	Argentina
Brazilian	2	Brazil
Ugandan	1	Uganda
Congolese	3	Belgian Congo
Iranian	13	Iran

† In India the distinctions of race are not easily maintainable, as the lines of race and religion are not strictly demarcated in the various publications which mix up race and religion. Whenever there is no clear line of distinction between them I have used the term 'Indian'.

Rhinosporidiosis has been recorded in 37 countries; males and females in 10; males only in 24; females only in 3.

Number of countries showing infection at one or more sites

All 4 sites: males 2; females 2
3 sites: males 4; females 1
2 sites: males 12; females 2
1 site: males 16; females 8

Infection at the different sites.

Nasal infection: males 28 countries; females 10 countries
Eye infection: males 16 countries; females 6 countries
Rare sites: males 8 countries; females 5 countries
Multiple sites: males 8 countries; females 2 countries

13 countries recorded only 1 case of infection in males (nose 8; eye 3; multiple 2).

6 countries recorded only 1 case of infection in females (nose 4; eye 2).

A very high percentage of cases of infection in both males and females has been reported from Asia: Males 974 (90·2 per cent); females 199 (92·1 per cent).

Ceylon compared with other countries as regards percentage incidence of infection at the different sites

	Infection of the nose		*Infection of the eye*		*Infection at rare and multiple sites*		*Total cases*
	No. of cases	*Percentage*	*No. of cases*	*Percentage*	*No. of cases*	*Percentage*	
Males							
Ceylon	344	64.5	140	26.3	49	9.2	533
All other countries	377	69.0	76	14.1	93	16.8	546
Females							
Ceylon	85	56.7	52	34.7	13	8.7	150
All other countries	44	66.7	10	15.2	12	18.1	66

Percentage of eye infection is higher in Ceylon than in other countries.

In males it is 1·9 times and in females 2·3 times the percentage in other countries.

Percentage of infection of the nose and at other sites is lower in Ceylon than in other countries.

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