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STUDY OF THE FOCALITY OF THE DISEASE IN NON-ENDEMIC COUNTRIES *

presented

by

Dr M.A. Parvez
WHO Epidemiologist

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* Prepared by the Division of Epidemiology, Directorate of Preventive Medicine, Ministry of Health, Sana'a

The Yemen Arab Republic is located in the southwest corner of the Arabian Peninsula. It is bordered by the People's Democratic Republic of Yemen in the South, the Red Sea in the West, and Saudi Arabia in the North. The eastern boundary within the Arabian desert, Rub Al Khali, is not clearly defined.

The country extends over an area of approximately 200 000 square kilometers and can be divided into three topographical regions. The coastal lowlands, known as the Tihama, stretch the length of the country bordering the Red Sea. This hot, sandy, semi-desert plain is 30 to 60 kilometers wide and the elevation ranges from sea level to about 200 meters. To the East of the Tihama and extending from the People's Democratic Republic of Yemen in the South to Saudi Arabia in the North are the highlands. (The highlands are usually divided into two separate regions: the foothills and middle heights at altitudes of 200 meters to 4500 meters, and the central highlands ranging from 1500 to roughly 3000 meters. In this report these two regions have been combined). From the highlands, the terrain slopes eastward forming the eastern semi-desert plateau which terminates in Rub Al Khali at an altitude of 1000 meters.

The Yemen Arab Republic is divided administratively into 10 governorates each of which is sub-divided into quadas. There are a total of 40 quadas in the country. Based on population projections, the mid-1979 population of the Yemen Arab Republic is estimated to be 6.4 million, of which approximately 1.2 million reside abroad. Of the remaining 5.2 million inhabitants, 90% live in rural areas and 73% of the population is engaged in agriculture. The Yemen Arab Republic has a population density of 35 persons per square kilometer, the southern highlands being most densely settled.

The City of Light, Yemen's colony for leprosy patients, is located three kilometers south of Taiz and includes a leprosarium as well as residential quarters. In 1974 the Missionaries of Charity came to the City of Light to begin regular treatment for those suffering from Leprosy.

The leprosarium has a total of 145 beds available to the more serious cases. Medicines, food, water, and supplies are jointly provided by the Ministry of Health and the Missionaries of Charity. At present, five sisters manage the leprosarium with the assistance of a staff of 14, all of whom are leprosy patients. In addition, a Peace Corps Volunteer nurse has been employed and a Swedish Doctor is on call for emergencies.

Minor surgery is performed in the dispensary of the leprosarium while cases for major surgery are referred to either the hospital in Jibla or the one in Taiz. However, it has been said that the hospitals do not encourage surgery for leprosy victims. Bacteriological tests are not conducted at the leprosarium on a regular basis, however they are carried out for diagnostic purposes. There is only a limited physiotherapy treatment.

The village itself is comprised of family dwellings as well as individual quarters. About 75 families reside in the City of Light with their family members who are being treated for leprosy. The combined population of the leprosarium and the village is estimated at 450 of which only 240 are suffering from leprosy. Approximately an equal number of patients receive treatment at the leprosarium dispensary but do not reside in the City of Light.

There is a primary school in the City of Light which provides education for children from kindergarten to class 4. Approximately 100 students are enrolled and there are two to three teachers provided by the Ministry of Education. If a child shows no deformities he may be sent to school for classes above grade 4 in Taiz.

In May 1979 leprosy patient data was requested and received by the Ministry of Health in Sana'a from the leprosarium. The information included the patient's name, age, sex, village, diagnosis, and duration of treatment. Following is a report based on that data.

Data was available on 240 cases of which 189 were male, or 78.7% and 51 were female, or 21.3%. Table I shows patient distribution according to the age group

and sex. It can be seen that the largest number of patients were 35 to 39 years of age represented by 30 males, or 12.5% of all patients, and 11 females, or 17.1% of all cases. 15.9% of all male cases and 21.6% of all female cases were in this age group. An equal number of females (11) were in the age bracket of 40 to 44 years which also accounts for 21.6% of all female cases. The age group with the second highest frequency for males is 55 to 59 years with 21 cases of 11.1% of all male patients. 9% of all males were under the age of 20 years, while no female cases were recorded under 20 years of age. Similarly, there were no female patients 60 years or older but 10.1% of all male patients were of this age. 70 of the 189 male patients, or 37% were 45 years of age or older while only 12 of the 51 female cases, or 23.5%, were in the same category. 58.9% of all females were 30 years of age to less than 45 years of age but only 35.5% of all males fell into the same age group. Frequency distribution of cases by age and sex is also represented in Figures 1 and 2.

TABLE I

AGE DISTRIBUTION OF PATIENTS IN CITY OF LIGHT BY SEX (MAY 1979)

AGE (YEARS)	MALES	% OF TOTAL MALES	% OF AGE GROUP	% OF TOTAL CASES	FEMALES	% OF TOTAL FEMALES	% OF AGE GROUP	% OF TOTAL CASES	TOTAL	% OF TOTAL CASES
0-4	0	0		0	0	0		0	0	0
5-9	0	0		0	0	0		0	0	0
10-14	8	4.2	100	3.3	0	0	0	0	8	3.3
15-19	9	4.8	100	3.75	0	0	0	0	9	3.75
20-24	15	7.9	88.2	6.25	2	3.9	11.8	.8	17	7.1
25-29	20	10.6	74.1	8.3	7	13.7	25.9	2.9	27	11.25
30-34	19	10.1	70.4	7.9	8	15.7	29.6	3.3	27	11.25
35-39	30	15.9	73.2	12.5	11	21.6	26.8	4.6	41	17.1
40-44	18	9.5	62.1	7.5	11	21.6	37.9	4.6	29	12.1
45-49	18	9.5	80.8	7.5	4	7.8	18.2	1.7	22	9.2
50-54	12	6.3	80	5	3	5.9	20	1.3	15	6.25
55-59	21	11.1	80.8	8.8	6	9.8	19.2	2.1	26	10.8
60 +	19	10.1	100	7.9	0	0	0	0	19	7.9
TOTAL	189	100		78.7	51	100		21.3	240	100

The cumulated frequency of case distribution by age and sex is illustrated in Table 2 and Figure 3. 25% of all patients were under the age of 30 years but over the age of 10 years. 25% were 30 to less than 39 years of age, 25% were 39 to less than 50 years of age, and 25% were 50 to less than 90 years of age. Similarly, 25% were 29 to less than 39 years of age, 25% were 39 to less than 52.5 years of age

and 25% were 52.5 to less than 90 years of age. Female cases were divided as follows: 25% were 33 years of age but greater than an age of 20 years; 25% were 33 years to less than 39 years of age; 25% were 39 years to less than 41 years; and 25% were 41 to less than 60 years of age.

TABLE 2

CUMULATED FREQUENCY OF PATIENTS IN CITY OF LIGHT BY AGE AND SEX (MAY 1979)

AGE(YEARS) LESS THAN	CUMULATED FREQUENCY		
	MALE	FEMALE	TOTAL
5	0	0	0
10	0	0	0
15	8	0	8
20	17	0	17
25	32	2	34
30	52	9	61
35	71	17	88
40	101	28	129
45	119	39	158
50	137	43	180
55	149	46	195
60	170	51	221
65	181	51	232
70	184	51	235
75	187	51	238
80	188	51	239
85	188	51	239
90	189	51	240

The percentage of total cases over the age of 50 years (25%) may be noteworthy. The ratio of number of leprosy cases 50 years of age and over per 100,000 population is 10:100,000. The ratio of number of leprosy cases 10 years to less than 50 years of age per 100,000 population is 7:100,000. A higher incidence of leprosy in the 50 year and over age bracket may indicate one of two things:

1. Leprosy in the Yemen Arab Republic begins at a late age;
2. Leprosy in people of the lower age groups is undiagnosed and therefore untreated.

The latter is a more probable rationale in that there is less tendency for physical deformities in the early stages of leprosy. If deformities are not present, people would not seek medical advice.

Table 3 and Figures 4,5 and 6 describe the geographical distribution of leprosy patients in the City of Light. Table 3 tabulates the number and percentage of males and females from each governorate. Figure 4 illustrates the number of cases and the percentage of the total cases in each governorate. Figure 5 clarifies by dot representation, the apportionment of patients in the City of Light. From the data collected only 216 of the total 240 cases, or 90%, could be identified by quads, or district, and is depicted in Figure 6.

TABLE 3: DISTRIBUTION OF PATIENTS IN CITY OF LIGHT BY GOVERNORATE (MAY 1979)

GOVERNO-RATE	MALES	% OF TO - TAL MALES	% OF GOVERNO-RATE	% OF TO-TAL CASES	FEMALES	% OF TO-TAL FEMALES	% OF GO-VERNORATE	% OF TO-TAL CASES	TOTAL	% OF TOTAL CASES
Ibb	54	28.6	79.4	22.5	14	27.45	20.6	5.8	68	28.3
Taiz	33	17.5	70.2	13.8	14	27.45	29.8	5.8	47	19.6
Dhamar	27	14.3	71.1	11.2	11	21.6	28.9	4.6	38	15.8
Sana'a	20	10.6	74.1	8.3	7	13.7	25.9	2.9	27	11.2
Hodeidah	18	9.5	94.7	7.5	1	2	5.3	.4	19	7.9
Hajja	15	7.9	100	6.2	0	0	0	0	15	6.2
Mahweet	12	6.35	85.7	5	2	3.9	14.3	.9	14	5.9
Sa'ada	5	2.65	71.4	2.1	2	3.9	28.6	.9	7	3
* PDRY	4	2.1	100	1.7	0	0	0	0	4	1.7
Beida	1	.5	100	.4	0	0	0	0	1	.4
Mareb	0	0		0	0	0		0	0	0
TOTAL	189	100		78.7	51	100		21.3	240	100

* People's Democratic Republic of Yemen is not a governorate of the Yemen Arab Republic but another country

The highest percentage of leprosy patients was from Ibb governorate with 28.3% representation as seen in Table 3 and Figure 4. Female cases from Ibb and Taiz governorates had the greatest frequency, each having 14 cases, or 27.45% of the total number of female patients. The greatest number of males were from Ibb governorate with 54, or 28.6% of the 189 cases. There were no reported female cases from Hajja or Beida governorates nor from People's Democratic Republic of Yemen. This cannot be considered unusual in view of the low percentage of female patients. In addition no cases, male or female, were recorded from Mareb governorate which could merely be a consequence of geographical and political isolation. The number of males from each governorate far exceed the number of females from the same governorate, although it cannot be concluded that leprosy is more common in males than in females since this may be a result of cultural practices regarding women.

A further distribution of leprosy cases according to quada is portrayed in Figure 6. Ibb quada with a total of 25 cases, had the highest frequency of patients from any one quada. It may be observed from Figures 5 and 6 that the greatest number of leprosy cases originate in the quadas in close proximity to the City of Light. It cannot be concluded that leprosy is more prevalent in this area due to the limited data used in this report.

Figure 7 divides the leprosy patients according to geographical region and shows that the majority of cases come from the highlands.

Finally, the number of cases per 100,000 population is exhibited in Figure 8.

The southern highland region, comprised of Dhamar, Ibb and Taiz has the greatest concentration of patients.

Again, until further studies are carried out it should not be inferred from Figures 7 and 8 that leprosy occurs more in inhabitants of this geographical region.

Diagnosis was divided into four leprosy types: lepromatous leprosy (L); tuberculoid leprosy (T); borderline lepromatous leprosy (BL); and borderline tuberculoid leprosy (BT). The distribution by leprosy types of the 240 cases in the City of

Light is represented in Table 4 and Figure 9. Figure 9 shows that the distribution between types was almost equal, with lepromatous leprosy accounting for the highest percentage of cases at 28.75% and borderline tuberculoid leprosy had the lowest frequency at 22.5%. Sex distribution between leprosy types is tabulated in Table 4, Here it can be seen that 53.9% of all male patients had lepromatous leprosy or borderline lepromatous leprosy as against 41.2% in females.

58.8% of all female cases were tuberculoid leprosy or borderline tuberculoid leprosy as against 46.1% in males.

TABLE 4

DISTRIBUTION OF PATIENTS IN CITY OF LIGHT ACCORDING TO LEPROSY TYPE
MAY 1979

TYPE	MALE	% OF TOTAL MALES	FEMALE	% OF TOTAL FEMALES	TOTAL	% OF TOTAL CASES
L	56	29.6	13	25.5	69	28.75
T	50	26.5	13	25.5	63	26.25
BL	46	24.3	8	15.7	54	22.5
BT	37	19.6	17	33.3	54	22.5
TOTAL	189	100	51	100	240	100

L = lepromatous leprosy BL = borderline lepromatous leprosy

T = tuberculoid leprosy BT = borderline tuberculoid leprosy

65.4%, or 157 of the total 240 leprosy cases displayed one or more deformities resulting from the disease. 10.4% had a deformity of one extremity and the remaining 55% had deformities of more than one extremity. The distribution of deformities and a deformity key is shown in Figure 10.

Deformity type P2, defined as deformity of more than one extremity, accounted for 63.7% of the total 157 deformity cases. Approximately 84% of all disfigured patients displayed a deformity of more than one extremity, including eye deformity (or were categorized in type P1-2, P2, P2-3 or P3). Only 6.4% of the 157 cases were of type P3, having a deformity of more than one extremity as well as an eye deformity.

TABLE 5

NUMBER AND PERCENTAGE OF PATIENTS DISPLAYING DEFORMITIES ACCORDING TO LEPROSY TYPE. CITY OF LIGHT. MAY 1979

TYPE	TOTAL CASES	TOTAL WITH DEFORMITY	% WITH DEFORMITY
L	69	37	53.6
T	63	49	77.8
BL	54	28	51.6
BT	54	43	79.6
TOTAL	240	157	65.4

Table 5 shows that tuberculoid leprosy and borderline tuberculoid leprosy cases had a higher incidence of deformities in comparison to lepromatous leprosy and borderline lepromatous leprosy cases.

The presence of a deformity in relation to age is listed in Table 6.

TABLE 6

BUMBER AND PERCENTAGE OF PATIENTS DISPLAYING DEFORMITIES ACCORDING TO AGE GROUP CITY OF LIGHT. MAY 1979

AGE GROUP	TOTAL CASES	TOTAL WITH DEFORMITY	% WITH DEFORMITY
0-4	0		
5-9	0		
10-14	8	2	25
15-19	9	3	33.3
20-24	17	8	47.1
25-29	27	18	66.6
30-34	27	19	70.4
35-39	41	25	61
40-44	29	21	72.4
45-49	22	17	77.3
50-54	15	13	86.7
55-59	26	19	73.1
60 +	19	12	63.2
TOTAL	240	157	

The percentage of deformities in the age groups 25 years and above is high and nearly the same, ranging from 61% in the 35 to 39 year category to 86.7% in the 50 to 54 year age bracket. In comparison, those patients under the age of 25 show a lower percentage of deformities.

TABLE 7

NUMBER AND PERCENTAGE OF PATIENTS DISPLAYING DEFORMITIES ACCORDING TO DURATION OF TREATMENT. CITY OF LIGHT. MAY 1979

DURATION OF TREATMENT (IN YEARS)	TOTAL CASES	TOTAL WITH DEFORMITY	% WITH DEFORMITY
0-4	86	47	54.7
5-9	68	39	57.4
10-14	28	21	75
15-19	21	19	90.5
20-24	10	8	80
25-29	20	17	85
30-34	6	5	83.3
35-39	0	0	0
40-44	1	1	100
TOTAL	240	157	

The percentage of deformities according to duration of treatment is charted in Table 7. The percentage of disfigured patients is high in every category of duration of treatment which may indicate that the deformity was present when treatment was initiated. There was no information available as to whether deformities were present at beginning of treatment therefore the effectiveness of treatment in relation to deformities cannot be determined.

SUMMARY

1. Of the total 240 leprosy cases, 78.7% (189) were male and 21.3% (51) were female .
2. The largest number of patients were 35 to 39 years of age. 41 patients or 17.1% of all cases, were in this age group.

3. 9% of all males were under the age of 20 years while no female cases were recorded under 20 years of age. Similarly, there were no female patients 60 years or older, but 10.1% of all male patients were of this age.
4. There is a higher incidence of leprosy per 100,000 population in the 50 year and over age groups as compared to the 10 to less than 50 year age groups, the ratios being 10:100,000 and 7:100,000 respectively.
5. The highest percentage of leprosy patients was from Ibb governorate with a representation of 28.3% of the total cases.
6. Ibb quada, with a total of 25 cases, had the highest frequency of patients from any one quada.
7. The greatest number of leprosy cases originate in the quadas in close proximity to the City of Light.
8. The greatest concentration of patients was found to be in the southern highland region.
9. The distribution of the 240 cases was found to be nearly equal between the four leprosy types.
10. There was a higher incidence of lepromatous leprosy and borderline lepromatous leprosy in males (53.9%) than in females (41.2%); a higher incidence of tuberculoid leprosy and borderline tuberculoid leprosy was found in females (58.8%) than in males (46.1%).
11. 65.4% of all leprosy patients displayed one or more deformities.
12. Tuberculoid leprosy and borderline tuberculoid leprosy cases had a higher incidence of deformities in comparison to lepromatous leprosy and borderline lepromatous leprosy cases.
13. The percentage of deformities in patients in the age groups 25 years and above is high in comparison to those in the less than 25 year age groups.
14. The percentage of deformities is high in every category of duration of treatment.

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