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STUDY OF MALARIA IN AFRICANS OF THE DAKAR AREA
OF SENEGAL

by

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During the years 1960 and 1961, 448 African patients were hospitalized for malaria in the Infectious Diseases Service of the Hôpital Aristide le Dantec, Dakar. 258 of these patients suffered from malaria alone while 190 suffered from malaria associated with another disease. During 1960, 130 patients were hospitalized, 58 for malaria in association with another disease and 72 for malaria alone; these cases included 33 cases of pernicious malaria with 14 deaths. In 1961, 318 patients were hospitalized; 132 for malaria associated with another disease and 186 for malaria alone; there were 108 cases of pernicious malaria and 31 deaths. Comparison of the figures for these two years shows an over-all relative rate of increase of 2.4, distinctly higher than the over-all increase in the rate of hospitalization which was 1.73 (2297/1325), and an absolute rate of increase of 1.4. The absolute rate of increase for malaria associated with another disease was 1.32; it was 1.5 for malaria alone and 1.77 for pernicious malaria (Table 1).

These general numerical data suffice to show the increasing importance of malaria in the Cape Verde region. The disease was in fact more frequent and more serious in 1961 than in the previous year, and it was for this reason that we undertook this study.

TABLE 1. DISTRIBUTION OF PATIENTS BY YEAR AND SEVERITY OF THE CASE - RATE OF INCREASE OF EACH FORM OF MALARIA

	Malaria alone			Type of malaria			
	Fatal	Pernicious non-fatal	Pernicious	Simple	Total	Associated	Over-all total
Total	45	96	141	117	258	190	448
1960	14	19	33	39	72	58	130
1961	32	77	108	78	186	132	318
Relative rate of increase	2.2	4	3.6	2	2.6	2.3	2.4
Absolute rate of increase	1.28	2.34	1.77	1.15	1.5	1.32	1.4

1. GENERAL NUMERICAL DATA

Sex

266 male and 182 female subjects were hospitalized i.e. 60% and 40%, respectively, which corresponds fairly well to the relative proportions of boys and girls hospitalized. This percentage is the same for both malaria alone and malaria in association with another disease (Table 2).

Age

All ages are represented, from six months to 67 years, but it was found that the incidence of malaria decreased progressively with age. This decrease is much more rapid in the case of malaria associated with another disease than in that of malaria alone. The curve of incidence by age for malaria associated with another disease is close to that for hospital admissions as a whole, whereas the curve for malaria alone is quite different and displaced in favour of the age-group six to 10 years (Figure 1). There does not appear to be any special relationship between sex and age; however it should be noted that in the case of malaria alone the seven hospitalized patients above 40 years of age were all men. If an over-all comparison of the two groups is made by age-group from five years to 20 years of age, then from 21 to 30 years and finally above 30 years, it is found (Tables 2 and 3) that for the

TABLE 2. DISTRIBUTION OF PATIENTS BY SEX, AGE AND SEVERITY OF THE DISEASE

Age (in years)	Malaria alone						Malaria associated with other diseases						Totals										
	Simple			Pernicious non-fatal			Pernicious fatal			Simple				Pernicious non-fatal			Pernicious fatal			Total			
	M	F	T	M	F	T	M	F	T	M	F	T		M	F	T	M	F	T				
	Total			Total			Total			Total				Total			Total						
< 1	0	2	2	2	1	3	1	0	1	1	0	1	8	4	12	0	1	1	1	0	1	13	19
1	0	2	2	2	1	3	0	1	1	0	1	1	21	11	32	2	1	3	1	0	1	36	42
2	5	3	8	4	1	5	2	2	4	2	2	4	17	12	29	1	0	1	1	0	1	31	48
3	3	2	5	5	4	9	3	2	5	3	2	5	9	4	13	1	0	1	1	1	2	16	35
4	2	1	3	5	2	7	3	2	5	3	2	5	8	3	11	1	0	1	1	0	1	12	27
5	0	2	2	3	3	6	2	3	4	2	3	4	5	3	8	1	0	1	1	0	1	9	22
6	1	1	2	3	4	7	2	5	7	2	5	7	4	1	5	1	1	1	1	0	1	7	23
7	2	3	5	7	4	11	2	2	4	2	2	4	2	3	5	1	1	1	1	1	1	6	26
8	1	0	1	5	3	8	3	1	4	3	1	4	3	3	6	1	1	1	1	1	1	7	20
9	2	0	2	0	3	3	2	0	2	2	0	2	0	1	1	0	0	0	0	0	0	1	8
10	4	1	5	2	3	5	2	1	3	2	1	3	2	1	3	2	0	2	2	0	2	5	18
11	3	2	5	4	1	5	0	1	1	0	1	1	0	2	2	0	0	0	0	0	0	2	13
12	3	2	5	1	1	2	1	1	2	1	1	2	2	0	2	2	0	2	2	0	2	4	13
13	1	3	4	2	1	3							2	1	2							3	10
14	3	1	4	1	1	2							0	2	2							2	8
15	0	3	3	1	4	5							0	1	1							1	9
16-20	9	4	13	4	4	8							3	2	5							5	26
21-30	14	8	22	1	2	3	1						8	6	14							14	40
31-40	10	7	17	1		1							5	4	9							9	27
41-50	5	0	5										3	2	5							5	10
51-60	1	1	1										2	0	2							2	3
> 60	1	1	1										1	0	1							1	1
	70	47	117	53	43	96	24	21	45	258	104	66	170	11	4	15	4	1	5	190	448		

M = Males
F = Females
T = Total

age-group 0-5 years, the number of hospital admissions for malaria associated with another disease is much higher than the number for malaria alone, since the proportion of the latter is only 39%. Above five years, the hospital admission rate for malaria alone is 60% to 80% of the whole. In other words, under five years of age, malaria appears to be relatively well tolerated and its presence would seem to be revealed in particular by an intercurrent complaint.

TABLE 3. FREQUENCY OF HOSPITAL ADMISSIONS FOR MALARIA ALONE IN RELATION TO AGE

Age	Malaria		Total (T)	i/T
	Alone (i)	Associated		
0-5	76	117	193	39%
6-10	69	26	95	73
11-15	41	12	53	78
16-20	21	5	26	81
21-30	26	14	40	65
> 30	25	16	41	61
	<hr/> 258	<hr/> 190		

TABLE 4. FREQUENCY OF HOSPITAL ADMISSIONS FOR MALARIA ALONE BY YEAR OF AGE FROM 0-5 YEARS

Age	Malaria		Total (T)	i/T
	Alone (i)	Associated		
Less than 1 year	6	13	19	32%
1 year	6	36	42	14
2 years	17	31	48	35
3 "	19	16	35	54
4 "	15	12	27	56
5 "	13	9	22	59

It can be seen that up to three years the frequency is 35% or less and that from three years onwards it is at least 54%. Thus malaria would seem to be particularly well tolerated under three years of age. Nevertheless it is frequent, since 109 cases of malaria from 0-2 years of age were hospitalized, i.e., 24.5%. The apparently surprising statement may therefore be made that malaria is frequent but well tolerated under three years of age.

Severity

In the case of malaria alone, it can be seen that there were 117 attacks of the simple form of the disease, 96 of pernicious malaria and 45 fatal cases. The over-all percentage of pernicious cases is 55% and the mortality rate 17.5%.

There is an evident connexion between severity of infection and age. Generally speaking the younger the subject (but over three years of age), the more grave is malaria. Thus, we did not observe the pernicious form in subjects over 40 years of age and there were no fatal attacks after 12 years of age, apart from one man of 22. If the severity of malaria is studied by five-year age-group up to 20 years, and then by intervals of 10 years over 20 years of age, a high incidence of the pernicious form is found under 10 years of age, an average incidence from 11-15 years and then a sudden fall in the number of serious forms (Table 5).

TABLE 5. PERNICIOUS MALARIA AND MORTALITY IN RELATION TO AGE IN THE CASE OF MALARIA ALONE

Age	"Simple" attacks	"Pernicious" malaria Totals	% of pernicious cases	Fatal attacks	% mortality
0-5 years	22	54	71	21	27.5
6-10 years	15	54	78	20	29
11-15 "	21	20	49	3	15
16-20 "	13	8	38	0	
21-30 "	22	4	11	1	
31-40 "	17	1	5	0	
41-50 "	5	0			
50 "	2	0			

Table 6 shows that malaria is most serious between three and eight years of age. Thus we again come, by a different route, to this limiting figure of three years in regard to the seriousness of malaria (Figure 2).

TABLE 6. STUDY BY YEAR OF AGE OF THE PERCENTAGE OF PERNICIOUS CASES AND MORTALITY FOR MALARIA ALONE

Age	% of pernicious cases	% mortality
Less than one year	66	16.5
1 year	66	16.5
2 years	53	23.5
3 years	74	26
4 "	80	33.3
5 "	85	38.4
6 "	87.5	43.7
7 "	75	20
8 "	92.3	30.7
9 years	71.4	28.6
10 "	61.6	23
11 "	55	9
12 "	45	22.2

When severity is studied in relation to sex, it appears that the proportion of female subjects rises with increasing severity of the disease (Table 7).

TABLE 7. RELATIVE FREQUENCY OF GIRLS AND BOYS ACCORDING TO THE SEVERITY OF MALARIA

Malaria	Boys		Girls	
	No.	%	No.	%
Simple malaria	70	60	47	40
Pernicious malaria (non-fatal)	53	55.2	43	44.8
Fatal attack	24	53	21	47

Study of severity in relation to sex and age does not yield any additional information since the figures are not significant.

In the category of malaria associated with another disease there were 170 attacks of simple malaria, 15 attacks of the pernicious form and five fatal attacks. Thus the percentage of pernicious cases was 11% and the mortality rate 2.5%, i.e., in nine cases out of 10 the malaria was well tolerated. The pernicious attacks all occurred during the first 12 years of life and the fatal ones between one and six years. Study of the percentage of pernicious forms and of mortality rates during the first 12 years of life shows that the percentage of pernicious cases is not more than 11% before three years of age and that from this age onwards it is at least 11% up to eight years of age, apart from four years of age, when it is 8.4%. The mortality rates are not significant (Table 8).

TABLE 8. STUDY BY YEAR OF AGE OF THE PERCENTAGE OF NON-FATAL PERNICIOUS FORMS AND MORTALITY FOR MALARIA ASSOCIATED WITH ANOTHER DISEASE

Age	Percentage of non-fatal pernicious cases	Percentage mortality
Less than 1 year	8	
1 year	11	2.8
2 years	6.5	3.2
3 years	19	12.5
4 "	8.4	
5 "	11	
6 "	29	14
7 "	17	
8 "	14	
9 years	0	
10 "	40	
11 "	0	
12 "	50	

2. EPIDEMIOLOGY

The patients come from almost everywhere in the Cape Verde peninsula, being chiefly members of the Wolof and Toucouleur tribes, but also including Serers and Kasamansas.

Malaria alone developed on an epidemic scale. In the 1960 epidemic the first admissions occurred in June (one case) and the last in January 1961 (also one case). In the 1961 epidemic, the extremes occurred in May and December. No patient was hospitalized in January 1961 for malaria alone. In both these years, the maximum number of admissions was in October - 34 and 70 cases, representing 47% and 37% of hospital admissions, respectively, in the two epidemics. September, October and November accounted together for 75% of the cases in each epidemic.

In regard to malaria associated with another disease, the first cases appeared in August 1960, apart from one case in April and two in May. As from August, the number of cases rapidly increased up to 20 in November and December 1960. In 1961, the number of hospital cases varied between five and 17. The pernicious forms were observed particularly during the second half of each year (Figure 3).

Thus a comparison of the two forms of malaria shows that malaria alone has followed an epidemic course whereas malaria associated with other diseases has followed an endemic one since August 1960. This endemic, moreover, tends to become more evident, for during January and February 1962, 15 and 20 cases, respectively, were observed. At present, therefore, there appears to be an increase of malaria in the Dakar area not only in the epidemic form during the wet season, but also in the endemic form during the dry season. The epidemic form has resulted in the admission of a considerable number of patients suffering from malaria alone, whereas in the endemic form the disease has come to light in connexion with various associated complaints.

From the epidemiological viewpoint, study of the severity of the disease in relation to time shows that for malaria alone, the over-all rate of pernicious cases was 46% and the mortality 19.5% during 1960. These percentages were 58% and 16.5%, respectively, in 1961. It can thus be seen that there was an aggravation in the latter year as compared with 1960. As concerns malaria in association with another disease on the contrary, there was a decrease in severity (Table 9).

TABLE 9. RATES OF INCREASE FOR EACH TYPE OF MALARIAL ATTACK

	Malaria alone					Malaria associated with another disease				
	Fatal	Non-fatal	Pern.	Simple	Total	Fatal	Non-fatal	Pern.	Simple	Total
No. of cases	14	19	33	39	72	4	6	10	48	58
%	19.5	21.5	46	54		7	11	18	82	
No. of cases	31	77	108	78	186	1	9	10	122	132
%	16.5	41	58	42		0.8	7.2	8	92	
Over-all %	17.5	37.5	55	45		2.6	7.9	10.5	89.5	
Relative rates of increase	2.2	4	3.6	2	2.6	0.25	1.5	1	2.5	2.3

The figures in relation to the month of hospitalization show that, although the low degree of significance of the results must be borne in mind, the rates for pernicious forms and mortality remained almost constant in the case of malaria alone; study of pernicious forms and mortality in the case of malaria associated with another disease reveals nothing of interest.

3. CLINICAL STUDY

Data in relation to time

Study of the length of domiciliary illness in the different groups (malaria alone either simple or fatal or non-fatal pernicious cases) (Table 10) shows that malaria is an acute disease following a rapid course. Thus 62% of patients were hospitalized during the first four days and only 10 were hospitalized after the tenth day of the disease.

TABLE 10. SEVERITY OF MALARIA ALONE IN RELATION TO THE LENGTH OF DOMICILIARY ILLNESS

No. of days at home	1	2	3	4	5	1 to 5	6	7	8	9	10	6 to 10
Simple attack	10	15	30	16	14	85	9	4	7	2	1	23
Pernicious non-fatal attack	19	7	29	7	12	74	1	4	2	3	1	11
Pernicious fatal attack	6	3	15	2	2	28	4	2	5	0	0	11
Total	35	25	74	25	28	187	14	10	14	5	10	45
Over-all percentage pernicious forms	71	41	53	36	50	55	35	60	50	60	50	49
Over-all percentage mortality	17	12	20	8	7	15	28	20	36	0	0	24.5
Mortality rate of pernicious attacks (%)	24	30	34	22	14	23						50

The maximum hospitalization rate occurred on the third day, i.e., during the second attack, and was very high (29%). The first and the second attacks were responsible for the admission of 109 patients (42%). Study of the over-all percentage of pernicious forms shows that it was highest for the odd numbers of days of domiciliary illness (above 50% for the odd days and less than 50% for the even days). The maximum of pernicious forms corresponded to the odd numbers of days of domiciliary illness. The over-all pernicious malaria rate was 55% for the first five days and 49% for the sixth to tenth days. On considering the mortality rate it can be seen that during the first five days it was never above 20, with a maximum on the third day (20) and a high figure of 17% on the first day. The over-all mortality rate by group of five days was 15% for the first five days and 24.5% for the next five. These apparently contradictory results are nevertheless all covered by the following statement: pernicious malaria is the more frequent the shorter the period during which the disease has been developing at home; pernicious malaria is the more serious the longer the period of development of the disease.

Symptomatology

There were always systematic disturbances and the averages of the temperature, pulse and respiration rates were, respectively:

Fatal attacks	39.6° C	150	46
Pernicious non fatal attacks	39.6° C	130	36
Simple attacks	39.6° C	110	32

Consequently, the temperature alone is not a serious sign, but there is a distinct increase in the average pulse rate and respiration rate in pernicious malaria. In our opinion an essential fact is that the extremes of temperature were observed only during hypothermia which was rarely encountered (five cases) and hyperthermia (12 patients had temperatures above 41° C). But these extreme temperature figures have, by themselves, no prognostic significance. There were two deaths out of five hypothermic cases; likewise, of 12 patients with a temperature above 41° C, two died.

On the contrary, there is no extreme figure for the cardiac and respiration rates, such as is found in the malignant forms of measles, for example (a pulse rate of 190 and a respiration rate of 75 were noted in only two cases). In the malignant form, found in all infectious diseases, the pulse rate often reaches more than 200 and the breathing rate is more than 80 per minute. Thus, although accelerated heart beat and respiration exist in malaria, and are higher the more serious the illness, we never encountered in our patients the essential collapse of these major functions which occurs in the malignant forms of infectious disease.

As for fall in blood pressure, this was a sign of cardiovascular collapse in 13 patients who died and in five patients with non-fatal pernicious attacks, i.e., in 12% of the pernicious cases.

The second sign most frequently encountered was the enlarged spleen, found on percussion in 80% of cases and palpable in 32% of cases. Malaria where the spleen was neither palpable nor found on percussion was seen in 20% of the patients. On the other hand, the liver was of normal size in 79% of cases and its enlargement was seldom considerable. Despite this, an enlarged liver was found in 62% of fatal cases of pernicious malaria and would thus seem to be a sign that the disease is serious.

The third reliable sign is neurological involvement whose extent varies according to the type of malaria, and which is found in 77% of the simple forms and in 100% of pernicious cases with a fatal outcome. This neurological involvement is revealed by various symptoms, but all cases show either headache or disturbances of consciousness.

Headache was the most common complaint, above all, in the simple attacks (80% of cases). It affected 74% of patients with a non-fatal pernicious attack and 56% of pernicious cases who died. Disturbances of consciousness were found particularly in fatal pernicious attacks (100%), as well as in 87% of non-fatal pernicious attacks and in 25% (in a minor form) of patients suffering from a simple form of malaria.

Disturbances of consciousness range from partial loss of consciousness to coma carus in the terminal phase.

The simple attacks may involve insensitivity in 7% of cases or torpor in 18%. 18% of pernicious cases which recovered showed insensitivity, while there was torpor in 51% and coma in 18%. In the fatal pernicious attacks there was partial insensitivity (7%), torpor (45%) and, above all, coma (49%). Coma is therefore a very real pointer to the seriousness of the disease since out of 39 comatose subjects, 22 died, i.e., 57%.

Slight intoxication was found in 3% of the simple forms, becoming definite cerebellar ataxia in 13% of the non-fatal pernicious cases. It was not found in any of the fatal cases. Patients rapidly recovered from such cerebellar ataxia but in one case it disappeared only on the tenth day.

Disordered agitation, and sometimes a confused dreamy state was found in 2% of the simple forms, 13% of the non-fatal pernicious cases and in 20% of the fatal cases. Above all, however, convulsive phenomena were frequently noted, either an isolated attack or a real epileptic state, but these responded well to symptomatic treatment (5% of the simple attacks, 39% of the non-fatal, pernicious attacks, and 49% of the fatal attacks). Out of 59 patients who developed convulsions, 22 died, i.e., 37%. In 10 patients, hypertonic symptoms were a sign of cerebral dysfunction; of these, four died. The other neurological signs may consist of meningeal symptoms, disturbance of the reflexes, as well as neurological focal symptoms.

The functional meningeal signs mainly take the form of headache and vomiting. Constipation is less frequent. Thus in simple attacks there were 81% of patients with vomiting but only 32% with constipation and 18% with diarrhoea. In non-fatal pernicious attacks, vomiting occurred in 64% of cases, constipation in 48%, and diarrhoea in 25%; in the fatal attacks, vomiting was encountered in 69% of cases, constipation in 22% and diarrhoea in 20%. Apart from intestinal disturbances, functional meningeal symptoms were thus encountered in more than two-thirds of the patients. The meningeal physical symptoms are still more inconstant: they were distinct in 11% of simple attacks, 44% of pernicious attacks and in 33% of fatal cases.

Disturbed reflexes are also not always found. They were normal in 94% of simple attacks, 64% of non-fatal pernicious attacks and 50% of fatal cases. There were no reflexes in 2% of simple cases, 33% of non-fatal pernicious attacks and 40% of fatal cases. They were exaggerated in 4% of simple attacks, 4% of non-fatal pernicious cases and 9% of fatal cases. A positive Babinski sign was found in only eight patients, two of whom died. It will therefore seem that the presence of normal reflexes indicates a good prognosis.

Focal neurological signs were rare. We noted six hemiplegias or monoplegias of central origin, one temporary aphasia, two paralyses of the seventh nerve, one paralysis of the sixth nerve, one paralysis of the fourth nerve, four cases of Jacksonian-Bravais epilepsy affecting an upper limb and finally one case of disturbance of the respiratory centres. We were able to record three electric-encephalograms which all showed very considerable diffuse cerebral involvement, predominant at the base, and more pronounced on the right-hand side in one case.

Less frequently, other relatively important symptoms were seen. In one case we noted an enlarged arrhythmic heart with return to normal in 10 days. In 5% of cases, malaria was accompanied by a fleeting urticarial, or morbilliform skin eruption. Abdominal pains were noted in 20% of patients, sometimes taking a pseudo-surgical peritoneal form (1% of cases).

Eighteen patients suffered from frank jaundice and of them 16 had pernicious attacks, seven of which were fatal. The jaundice was of haemolytic origin and was a bad prognostic sign, since the patient had 44 chances out of 100 of dying.

In 40% of cases, the fatal pernicious attack occurred in an anaemic patient. Haemolytic anaemia occurred in 37% of non-fatal pernicious cases and in 31% of simple attacks. It was so severe in 13 cases as to cause death (30% of the cases); it is thus a serious symptom.

The biological signs examined were the test, based on the examination of cerebrospinal fluid, and thick film, differential blood count.

In five cases out of six of fatal pernicious malaria the blood picture showed, apart from anaemia, distinct leucocytosis, sometimes amounting to frank hyperleucocytosis. The extreme figure was 35 000 white cells in the case of a subject with frank haemolytic jaundice. Leucocytosis of this nature was found in 24% of non-fatal pernicious attacks and in 4% of simple attacks, and would thus seem to be a sign of the seriousness of the disease.

The cerebrospinal fluid was examined in patients with frank meningeal symptoms. Lymphocytosis and moderate hyperalbuminorachia existed in 38% of the fatal cases. Lymphocytosis was noted in 16% and hyperalbuminorachia in 5% of pernicious non-fatal attacks. Thus a change in the CSF would seem to be a bad prognostic sign since 50% of these patients died. The number of cells was between five and 22 per mm³. Albuminorachia was never above 0.80 g per litre.

The thick film revealed the presence of malaria parasites in all our patients. The parasite density was determined in each case and, according to size, marked with one, two or three crosses; the results are shown in the following table:

Thick film	Fatal attack %	Non-fatal pernicious attack %	Simple attack %
+	20	30	36
++	30	40	35
+++	42	30	29
0	8		

It would seem that a high parasite density is observed more frequently, although by no means always, in severe forms of malaria.

In certain cases a diagnosis of clinical malaria has seemed beyond doubt and nevertheless the thick films have been negative. Apart from fatal cases where the diagnosis was confirmed by pathological examination, none of the other observations of this kind have been included in the present study. There were 35 cases of this type: 13 suffered from simple attacks of malaria, 15 from a non-fatal pernicious malaria and seven from a fatal pernicious malaria. When these cases are taken in conjunction with the observations studied, it would seem that in 10% of cases, malaria can exist without the possibility to obtain laboratory confirmation. In regard to pernicious attacks, this percentage would seem to be 15%.

We have seen that in 190 patients malaria was intercurrent, associated with another disease. The following table indicates these diseases and those during which malaria was most often encountered.

Disease	No. of cases with associated malaria	No. of cases without associated malaria	Percentage
Measles	68	1 041	6.5
Tetanus	15	389	3.8
Whooping cough	10	183	5.4
Diphtheria	6	149	4.0
Amoebiasis	7	191	3.6
Purulent meningitis	4	82	4.8
Typhoid fever	8	72	11.1
Tuberculosis	8	64	12.5
Other	64	1 454	4.4
Total	190	3 625	5.2

The table shows that two diseases were found in more frequent association with malaria, namely tuberculosis and typhoid. Next come measles and tetanus; with regard to the latter the association was noted, particularly between eight and ten days after one administration of the serum. In general, malaria was found in 5% of patients admitted to the Infectious Diseases Service for some other complaint.

Thus, we found malaria in Africans to take the form of acute febrile encephalitis with meningeal irritation. Diagnosis is based on enlarged spleen associated with cerebral involvement, and confirmed by thick film examinations.

Intense neurological disturbances, in particular troubles of consciousness, are serious clinical signs: anaemia is also a serious sign which is specially significant when it is severe, either in association with frank haemolytic jaundice or with enlarged liver. Particularly grave is the association with encephalitis of these three symptoms, i.e., anaemia, jaundice and enlarged liver.

From the biological viewpoint, a high parasite density found in the thick film, is not an absolute criterion of seriousness. On the other hand, the finding of polynuclear leucocytosis would seem to be much more significant.

However, the very gloomy prognosis inevitably reached in the presence of these signs, can be rapidly changed by specific treatment, for the mortality rate falls to zero at the end of the first 24 hours of hospitalization. Thus, in the final analysis it is the time factor which decides the fate of the patient.

4. MALARIA DIAGNOSIS IN AFRICANS

There is one essential fact in regard to malaria diagnosis in the endemic areas: such diagnosis must be primarily clinical and secondarily parasitological. It calls for a precise knowledge of the manifestations of the disease in order to avoid the errors which are only too easily made. We have described the usual clinical picture of the complaint and must now turn to the difficulties accompanying diagnosis in Africans.

Malaria often goes unrecognized in the temperate regions because no one thinks of it and this unfortunate fact has been stressed in recent publications. If malaria is considered a possibility, then the discovery of the parasite is the necessary sign, so that laboratory tests form the essential part of the diagnosis.

In the areas where malaria flourishes, particularly in Africa, south of the Sahara, the position is quite different. It is common in certain highly malarious regions to find that subjects who are free from fever and apparently healthy give positive thick films. When the subject is feverish, there are two dangers: either

the fever may be attributed to malaria alone and an intercurrent complaint may thus be left untreated, or serious acute malaria may go unrecognized because laboratory tests are neglected. These two extremes which have been stressed by all the classic authors, must be corrected by a precise knowledge of the clinical forms of the disease; diagnosis should be more clinical than biological, discovery of plasmodia in the blood stream being regarded an absolute criterion only in the temperate regions. Although in these regions the detection of plasmodia is a necessary and sufficient condition for diagnosis of the disease, in the tropics it is not only insufficient but sometimes unnecessary, as implied by the old golden rule of malaria treatment: never treat an attack of simple malaria without a confirmatory blood examination; never hesitate to employ specific treatment in a serious attack, even without a positive thick film.

The clinical diagnosis of acute malaria in Africans may present difficulties in the following three cases:

(a) Malaria emerging on the occasion of a known feverish illness

It is common during the course or abatement of any infectious disease and, more generally, of any feverish complaint, to observe an attack of malaria which adds its note to the clinical picture shown by the patient. The presence of malaria should be suspected and recognized, not only when there are positive signs of the disease but also when an unexplained fever, anaemia, jaundice, enlarged spleen, or encephalitic symptoms are abnormally superimposed on the clinical picture of the main complaint. Such malaria, often mild, particularly if treated in time, may, however, develop into a pernicious form if left untreated; thus, in cases of measles, death from malaria is relatively frequent.

(b) Case of clinically probable malaria not confirmed by the thick film

In 10% of acute malaria cases, as we have seen, the standard examination of that thick film may be negative. When malaria is clinically evident and serious, treatment should usually be commenced without awaiting the laboratory results. Under certain circumstances, particularly when the only sign of malaria is the aggravation of a single symptom, clinical diagnosis is merely probable and the normal attitude is naturally to try to detect the parasite before treating the patient. Thus,

meningeal conditions, febrile epileptic states, serious jaundice, severe acute anaemia, tetanoid attacks, and acute ataxia are clinical conditions which may be due to malaria but may also have some other etiology. If the thick film is positive there is a high probability of malaria, and specific treatment will, in curing the patient, confirm the diagnosis, so to speak. If the thick film is negative, hesitation to commence treatment is understandable but the least sign of a grave malarial attack calls for a decision to commence treatment.

Anomalous clinical signs in the picture of a known feverish disease should lead us to consider the possibility of associated malaria, which may be revealed by clinical symptoms and confirmed by laboratory tests.

(c) Cases of illness attributed incorrectly to malaria on the basis of a positive thick film

Under such conditions there is always an anomalous clinical element which should arrest the attention. The sudden febrile anaemia of the sickler, the fever "en plateau" of typhoid, a case of virus lymphocytic meningitis, may all be wrongly attributed to malaria on the evidence of a positive, thick film.

FIG. 1
MALARIA IN RELATION TO AGE

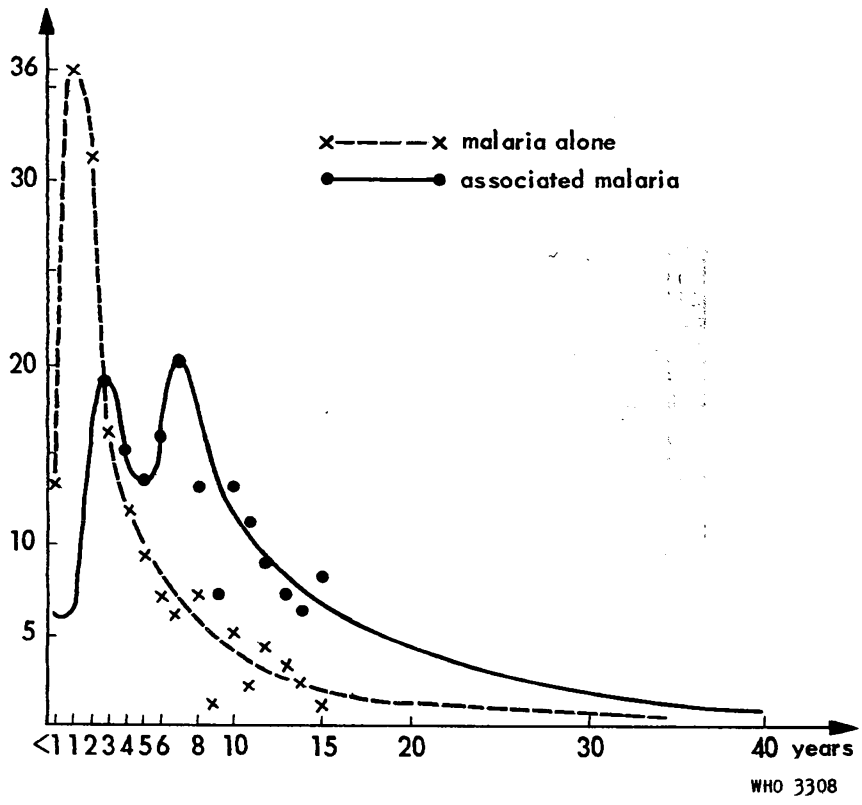
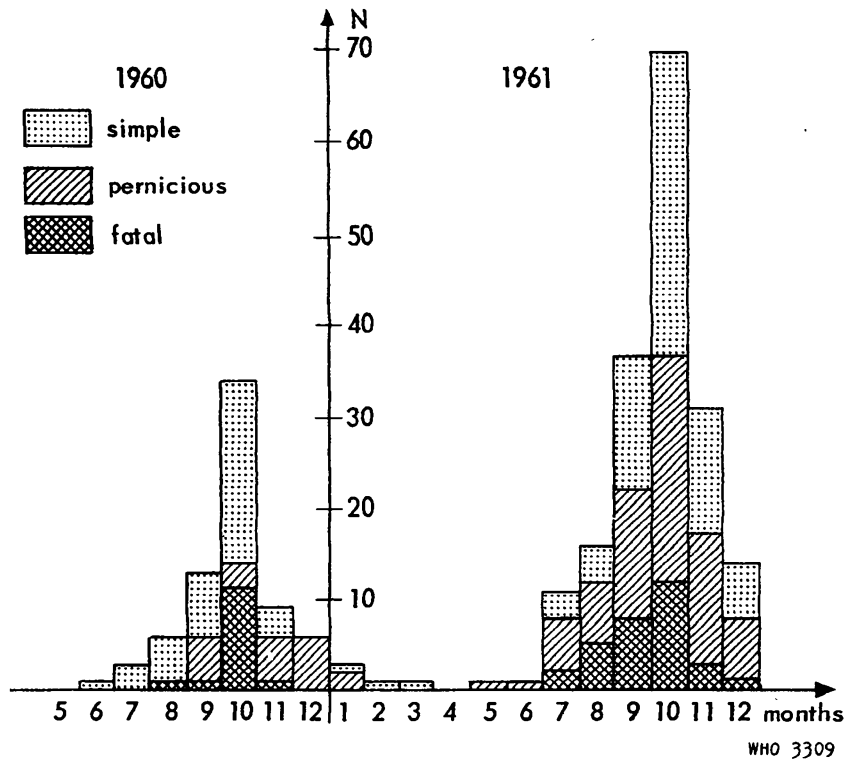


FIG. 2
MALARIA ALONE



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FIG. 3

MALARIA ASSOCIATED WITH ANOTHER DISEASE

