

Annual report / Department of Public Health, Research Institute and Endemic Diseases Hospital.

Contributors

Egypt. Maṣlaḥat al-Ṣiḥḥah al-'Umūmīyah. Research Institute and Endemic Diseases Hospital.

Publication/Creation

Bulaq, Cairo : Govt. Press, [1935]

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MINISTRY OF PUBLIC HEALTH, EGYPT



THE RESEARCH INSTITUTE AND THE
ENDEMIC DISEASES HOSPITAL

FIFTH ANNUAL REPORT
1935

CAIRO
GOVERNMENT PRESS, BULÂQ
1939



MINISTRY OF PUBLIC HEALTH

Fouad the First Institute
and Hospital for Tropical Diseases



DEAR SIR,

I beg to inform you that the name of the Research Institute and Endemic Diseases Hospital was changed as follows :—

“ Fouad the First Institute and Hospital for Tropical Diseases. ”

This is for favour of information.

With my best regards.

Yours faithfully,

DR. M. KHALIL BEY,

Director,

*Fouad the First Institute
and Hospital for Tropical Diseases.*



MINISTRY OF PUBLIC HEALTH

Found the First Institute
and Hospital for Tropical Diseases

Dear Sir,

I beg to inform you that the name of the Research Institute and
Epidemic Diseases Hospital was changed as follows:—

"Found the First Institute and Hospital for Tropical Diseases."

This is for favour of information.

With my best regards,

Yours faithfully,

Dr. M. K. Das,

Director,

Found the First Institute
and Hospital for Tropical Diseases

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MINISTRY OF PUBLIC HEALTH, EGYPT



THE RESEARCH INSTITUTE AND THE
ENDEMIC DISEASES HOSPITAL

FIFTH ANNUAL REPORT

1935

CAIRO
GOVERNMENT PRESS, BULÂQ
1939

THE UNIVERSITY OF CHICAGO



THE UNIVERSITY OF CHICAGO

1935

EXCELLENCY,

I have the honour to submit my report on the Research Institute and the Endemic Diseases Hospital and the work done during the year 1935.

CAIRO, *September 1936.*

I have the honour to be,
Excellency,

Your obedient servant,
DR. M. KHALIL BEY,
Director, Research Institute.

H.E. THE UNDER-SECRETARY OF STATE,
MINISTRY OF PUBLIC HEALTH,
CAIRO.

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THE RESEARCH INSTITUTE AND THE ENDEMIC DISEASES HOSPITALS, CAIRO

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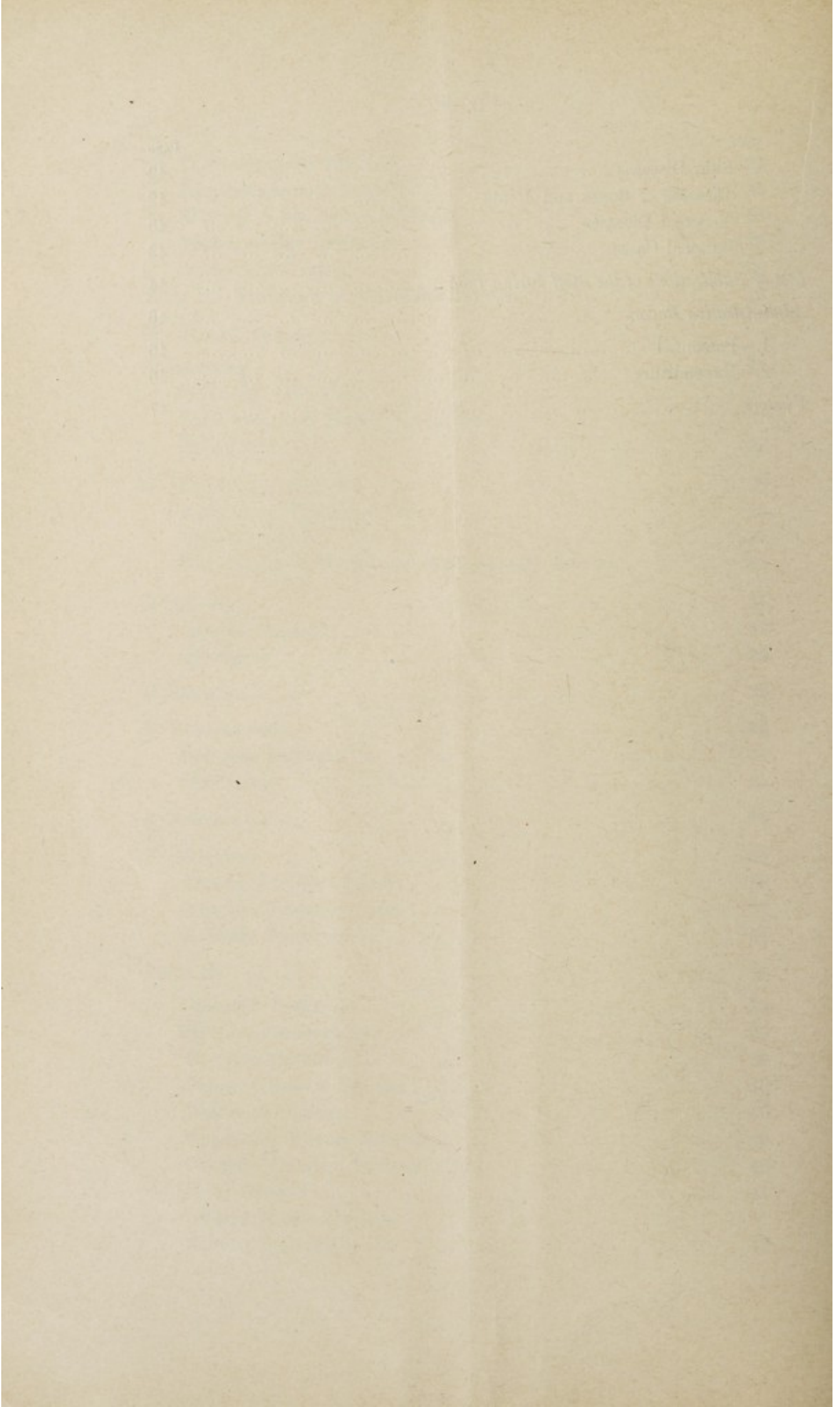
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CONTENTS

	Page
Foreword	XI
PART I.—REPORTS ON THE SCIENTIFIC SECTIONS	
SECTION I.— <i>Biochemistry</i> :—	
The Chemical Composition of the Spleen in Egyptian Splenomegaly	1
The Absorption Spectra of Hydroxy Anthraquinones	2
A Comparative of the Different Liver Function Tests	2
The Chemical Changes produced in the Liver Following the Administration of Antimony	3
SECTION II.— <i>Experimental Medicine</i> :—	
Studies on Anaemias in Egypt	4
Bone-Marrow Studies	7
Pathology of Splenomegaly	7
Studies on Jaundice	9
Action of Antimony on the Liver	10
Inoculation Malaria	10
SECTION III.— <i>Helminthological and Protozoology Section</i> :—	
Trematode Infection among Snails	11
Experimental Infection of Various Laboratory Animals with Schistosomiasis	13
SECTION IV.— <i>Medical Entomology</i> :—	
Identification of Insects Sent to the Research Institute	14
PART II.—CLINICAL REPORT	
I. <i>Out-Patients</i> :—	
Treatment of Bilharziasis with Fouadin	18
Results of Treatment of Bilharziasis by Fouadin... ..	19
Table I.—Fouadin in Treatment of Schistosomiasis	20
Treatment of Ancylostoma Infection with Carbon Tetra Chloride	21
Treatment of Ascaris with Ascaridol	22
Mixed infection with both Ascaris and Ancylostoma, treated with a Mixture of Carbon Tetra Chloride and Oil Chenopodium	23
Treatment of Taenia saginata	23
Enterobius vermicularis Infection	24

	Page
Trichostrongylus Infection	24
Hymenolepis nana Infection	25
Heterophys heterophys infection	25
Trichocephalus Infections	25
Strongyloides Infection	25
Table II.—Treatment of Helminthic Infection	26
 II.— <i>Special Investigations</i> :—	
A. Anaemias	27
Helminthic Anaemias	27
Cases Free from Helminthic Infection	27
Treatment	28
B. Hepato-Splenomegalies	28
Aetiological Analysis of Cases	28
Splenectomy	29
Haematological Studies on Hepato-Lienal Fibrosis... ..	29
C. Malaria	31
Malarial Hepatitis	32
Treatment	32
D. Jaundice... ..	33
E. Leishmaniasis	34
Berberine Sulphate	34
Diathermy	34
F. Pellagra	34
G. Dysentery	36
General Analysis of Cases	36
Amoebic Dysentery Cases	37
Bacillary Dysentery	37
Table III	38
Bilharzial Dysentery	39
Heterophyes Dysentery	39
H. Other Conditions	39
Digestive System Diseases	40
Deficiency Diseases	40
Respiratory System Diseases	40
Circulatory System Diseases	40
Blood Diseases	41
Urinary System Diseases	41
Nervous System Diseases	42

	Page
Skin Diseases	42
Diseases of Bones and Joints	42
Venereal Diseases	43
Surgical Cases	43
<i>List of Publications of the Staff during 1935</i>	44
<i>Administrative Report</i>	46
1.—Personnel	46
2.—Expenditure	46
<i>Visitors</i>	47



FOREWORD

The present report is the 5th of the series published annually from the Research Institute and the Hospital for Endemic Diseases.

During 1935, the investigation of the disease known as Egyptian Splenomegaly was continued. It was found that under this heading several diseases are included. Most of the cases, however, are associated with Intestinal Schistosomiasis.

An attempt was made to study pure *Ancylostoma* anaemia. It is surprising to observe that very few cases occur in Egypt, in which *Ancylostoma* infection is not associated with some other parasites.

A chance occurred of examining an area in Egypt before changing the method of irrigation from basin to perennial. The incidence of *Schistosoma* infection is known to be very slight in areas under basin irrigation where the land remains dry and exposed to the sun in the hottest months of the year, while in areas under perennial irrigation the incidence is high.

No definite observations on an area before and after the adoption of perennial irrigation are yet available. Four different areas in the south of Egypt were selected and their inhabitants carefully examined for Helminthic infections. When perennial irrigation will be introduced these areas will be resurveyed and the change will be recorded.

M. KHALIL

THE FUTURE

The future of the world is a subject which has long attracted the attention of philosophers and statesmen. It is a subject which has been discussed in many different ways, and it is one which has always been of great importance to the human race.

In the past, the future has been seen as a series of events which are predetermined and which cannot be changed. This view of the future has been the basis of many different religions and philosophies, and it has been the cause of much suffering and pain.

But in the last few years, there has been a change in the way in which the future is viewed. It is now seen as something which is not predetermined, but which can be changed by the actions of the human race. This new view of the future has been the basis of many different movements and philosophies, and it has been the cause of much hope and joy.

The future is a subject which is of great importance to the human race. It is a subject which has been discussed in many different ways, and it is one which has always been of great importance to the human race. In the past, the future has been seen as a series of events which are predetermined and which cannot be changed. This view of the future has been the basis of many different religions and philosophies, and it has been the cause of much suffering and pain.

But in the last few years, there has been a change in the way in which the future is viewed. It is now seen as something which is not predetermined, but which can be changed by the actions of the human race. This new view of the future has been the basis of many different movements and philosophies, and it has been the cause of much hope and joy.

THE FUTURE

MINISTRY OF PUBLIC HEALTH, EGYPT

The Research Institute and the Endemic
Diseases Hospital

Fifth Annual Report, 1935

SECTION I.—Biochemistry

THE CHEMICAL COMPOSITION OF THE SPLEEN IN
EGYPTIAN SPLENOMEGALY

In the Annual Report of the Research Institute for the year 1934, the provenience of the spleens used in this investigation as well as with the methods employed in their chemical analysis were given in detail. The following estimations were carried out :—

- (1) Moisture.
- (2) Total Nitrogen.
- (3) Glycogen.
- (4) Total Fat "Crude".
- (5) Total Fatty Acids.
- (6) Cholesterol.
- (7) Phospholipids.
- (8) Phosphorus.
- (9) Ash.
- (10) Iron.
- (11) Calcium.

From the chemical analysis carried out on 8 spleens from Egyptian Splenomegaly cases and 4 normal Egyptian spleens no difference in chemical composition could be detected apart from a slight increase in the inorganic constituents of three of the diseased spleens. This is represented by a slight increase in calcium. In these three spleens the calcium calculated as ca = 0.065 per cent. Normal = 0.029 per cent.

Out of the 8 spleens examined two contained fibrosiderotic nodules. In one of these, which contained a large number of nodules the percentage of iron was higher than normal; iron calculated as Fe = 0.124 per cent. Normal = 0.06 per cent. As has been mentioned before (*see* 1934 Report) these nodules, when dissected from the tissue and dried at 100 °C., contain about 1.4 per cent of iron calculated as Fe.

Further chemical analysis are carried out on spleens from various localities in Egypt where the disease is endemic.

THE ABSORPTION SPECTRA OF HYDROXY ANTHRAQUINONES

During a 5-month mission to study spectrophotometry, it was suggested by Dr. Morton of the Liverpool University to measure and examine the absorption spectra of some of the hydroxy anthraquinones with the object of finding the effect of chelation of some of these compounds on their absorption spectra. The following hydroxy anthraquinones together with their mono-methyl and dimethyl ethers were prepared in a crystalline form and their U.V. absorption spectra measured in different solvents, *viz.*: alcohol, hexane and N/10 soda.

- (1) *A* and *B* hydroxy anthraquinone and its mono-methyl ether.
- (2) 1 : 2 dihydroxy anthraquinone and its mono and dimethylether.
- (3) 1 : 4 " " " " "
- (4) 1 : 5 " " " " "
- (5) 1 : 8 " " " " "
- (6) 2 : 6 " " " dimethyl ether.

Details of the spectrographic investigations of these compounds will be published in the Journal of the Chemical Society, London

A COMPARATIVE OF THE DIFFERENT LIVER FUNCTION TESTS

(Carried out in collaboration with the Experimental Pathology and Medicine Section)

The following liver function tests, considered now by several workers to be of great value in detecting liver damage are performed on patients and the results obtained are compared with the clinical findings to ascertain which of these tests are the most valuable for the detection of liver damage.

These tests are :—

Icterus Index.

Van den Bergh's Test.

Urobilinogen.

Galactose Tolerance Test.

Galactose Tolerance Test with Histamine.

Levulose Tolerance Test.

Bromosulphalein Test.

Roger's Test.

Results obtained will be published soon.

THE CHEMICAL CHANGES PRODUCED IN THE LIVER FOLLOWING
THE ADMINISTRATION OF ANTIMONY

*(This work is carried out in collaboration with the
Experimental Pathology and Medicine Section)*

A survey of the literature reveals the fact that no previous work has been done to detect the chemical changes which may be produced in the liver following the administration of Antimony.

In this work male Guinea pigs of equal weight were used. The animals were kept on a standard diet during the experiments.

Three groups of animals were used :—

I.—Received each 12 injections of 0.5 c.c. Fouadin every other day.

II.—Received 12 injections of 1 c.c. Fouadin every other day.

III.—Received 12 injections of Fouadin every other day as follows :

3 injections of 0.5 c.c.

3 injections of 1 c.c.

3 injections of $1\frac{1}{2}$ c.c.

3 injections of 2 c.c.

All animals gained in weight during the experiment except group III where the animals had lost about $\frac{1}{8}$ of their weight by the end of the course of injections.

The following chemical analysis were carried out on the livers of these animals :—

Water, glycogen, total fat, total fatty acids, phospholipids and cholesterol.

Group I.—The livers of the animals in this group were slightly enlarged and appeared to be congested.

The glycogen was slightly lower than normal while the lipids and cholesterol were normal.

Group II.—Results are almost similar to group I.

Group III.—The glycogen content of the livers showed a marked reduction, total lipids were slightly increased, the phospholipid fraction was decreased and the neutral fat was increased.

(The results of this work are under publication).

SECTION II.—Experimental Medicine

A.—STUDIES ON ANAEMIAS IN EGYPT

1.—*Blood of Normal Soldiers.*—An investigation of 180 Egyptian soldiers presented an opportunity of selecting cases, free from parasitic infections and any other disease, for haematological studies. Among the total number only six such cases were found.

As a class, the soldiers stand between the fellaheen and the middle classes. Their diet is constant and rather at the lower limit of normal requirement.

		Minimum	Maximum
Average Hb. value was	86%	80%	100%
Average R.B.C. count	4,600,000	4,000,000	5,000,000
Average W.B.C. total	6,400	5,320	8,000
<i>Differ :</i>			
Eos.	2.5%	1%	5%
Neutr.	66%	65.5%	67.5%
Lymph.	25%	20%	28%
Mono.	5%	3%	7.5%
Average platelet count	230,000	180,600	280,500
Average volume index	0.9 μ	0.83 μ	1.04 μ
Average fragility	0.46–0.36		
Average icterus index	2.75 units	2.5 units	3 units
Average diameter of R.B.C. ...	7.38 μ	7.09 μ	7.58 μ
<i>Test Meal :</i>			
Normal seretion	4		
Hyperacidity	2		

In all these cases the Bilharzia cutaneous reaction was negative and there was no evidence of any disease.

2.—*Pure Ancylostoma Anaemia.*—A comparative study of the degree of anaemia in soldiers and the hospital class of poor people was undertaken to support the importance of the nutritional factor in the production of this anaemia.

Two batches suffering from nearly the same degree of infection, as judged by the egg count, were chosen.

	Soldiers			Hospital Class of People		
	Average	Minimum	Maximum	Average	Minimum	Maximum
Haemoglobin ...	72%	65%	85%	32%	20%	55%
R.B.C. count ...	3,800,000	3,250,000	4,600,000	2,250,000	1,600,000	3,200,000
W.B.C. Total ...	7,100	5,800	8,600	8,300	7,100	14,600
<i>Differ :</i>						
Eos. ...	9.54%	4%	16%	11%	1%	27%
Neutr. ...	62.54%	52%	70%	58%	38%	85%
Lymph. ...	22.81%	19%	27%	23%	6%	42%
Mono. ...	4.45%	3%	7%	4%	2%	6%
Reticulocytes ...	0.7 %	0.5%	1.0%	1.6%	1.1%	2.5%
Blood Platelets	186,000	132,000	154,000	185,000	142,800	218,000
Diameter Index	7.320	7 μ	7.58 μ	6.92 μ	6.7 μ	7.32 μ
Icterus Index ...	2.2 units	2 units	3 units	2 units	1 unit	3 units
Fragility ...	0.46-0.36	—	—	0.46	0.36	
<i>Test Meal :</i>						
Normal ...	6	—	—	2		
Hyperacidity ...	3	—	—	2		
Hypoacidity ...	3	—	—	3		
				3 achlorhydria (hist. posit.)		

As a result of this investigation the following conclusions may be drawn :—

(a) The influence of poor diet on the aggravation of the anaemia is clearly seen in class II.

(b) The higher reticulocytic counts in class II suggest bone-marrow stimulation as a result of anoxaemia corresponding to the more marked anaemia.

3.—*Trial of Congo Red Intravenously in Helminthic Anaemia.*—Schemensky (Deutsch. Med. Wschr., No. 24, 1935) reported that Congo red injections influenced the blood picture in cases of Addisonian and Addisonian-like anaemia to such an extent, that nearly normal findings were obtained. In some cases, liver therapy had to be added in a dosage which alone would have been insufficient. In some other cases, however, Congo red was without effect. The favourable influence of Congo red therapy manifests itself by a fall of temperature and decrease of the swelling of liver and spleen.

Congo red therapy was given a trial in two cases of severe helminthic anaemia, with the following results :

5—15 c.c. of 0·5 per cent Congo red solution, injected intravenously, produced in both cases a reaction without subsequent improvement of the blood picture. On the contrary, in one case a slight fall in both R.B.C. and Hb. was noticed after four injections.

4.—*Effect of Lecithin Rich Diet on Ancylostoma-Anaemia.*—Resistance of the R.B.C. is held to be dependent on a balance between the cholesterol and lecithin absorbed on their surface. Diet influences this relation. Addition of lecithin to grass diet (poor in lecithin) caused, in rabbits, increased rate of blood regeneration due to increase of haemolysis as shown by increased urobilin excretion.

Addition of butter and eggs to the diet of a patient, just at the time when the reticulocytic curve was declining after iron, showed the occurrence of another peak and a quicker increase of an already stationary Hb. level and of R.B.Cs.

Further experiments to prove the rôle of lecithin and its level in the blood are being made.

5.—*Trichostrongylus Anaemia.*—Six cases in which pure trichostrongylus infection was the cause of a marked anaemia, were found. In four of them achlorhydria (histamine positive) was demonstrated. Detailed haematological studies of these cases will be published when sufficient material is available.

6.—*Simple Achlorhydric Anaemia (Idiopathic Hypochromic Anaemia).*—Twelve cases of this type were met with. The haematological and clinical pictures correspond to the description of similar cases in other countries with the exception of a prevalence in males as compared with cases reported abroad. Six of this group of anaemia were males and six females.

The study of the gastric secretion of these cases showed :

Achylia (histamine negative)	2
Achlorhydria (histamine positive)	6
Hypochlorhydria	3
Hyperchlorhydria	1
(Alcohol histamine method).	

The bone-marrow, obtained by sternal puncture, was studied in five of these cases (see bone-marrow studies).

B.—BONE-MARROW STUDIES

An attempt was made to analyse the indications and value of bone-marrow studies by sternal puncture by investigating a series of cases. The information gathered in each particular case will be published later.

The bone-marrow was studied in the following conditions :—

	cases
1. Generalised glandular enlargements	5
2. Thrombocytopenic purpura	2
3. Chronic haemolytic anaemia	1
4. Idiopathic steatorrhea	3
5. Sprue	1
6. Addisonian anaemia	4
7. Hypochromic anaemia not responding to iron	3
8. Haemochromatosis	1
9. Agranulocytosis... ..	1
10. Simple achlorhydric anaemia	5
11. Leucaemia	2
12. Bilharzial hepato-lienal fibrosis	38
13. Malarial splenomegaly	12
14. Pure Ancylostoma Anaemia	18

Some of these cases were studied at the medical Unit, University College, London, by the courtesy of Dr. McKnee and Dr. Elliot.

In addition to describing the various bone-marrow reactions in these conditions, these studies show the sternal puncture to be of diagnostic value in general glandular enlargement, some hypochromic anaemias not responding to iron and haemochromatosis, and of prognostic value in agranulocytosis, purpuras, etc.

C.—PATHOLOGY OF SPLENOMEGALY

1.—Spleens removed by operation from cases of pure *Bilharzial Hepato-Lienal Fibrosis* were studied histologically and compared with the various types of splenomegaly met with in Great Britain. The condition was found to resemble histologically, with slight differences, the picture of the spleen in the hepato-lienal fibrosis group (previously named splenic anaemia) and accordingly the above name was given to the condition in place of "Egyptian Splenomegaly".

The enlargement of the spleen in this condition is due to *reticulo-fibrosis + venous congestion*.

Marked increase in reticular fibrils could be demonstrated by the silver impregnation method, while the subsequent fibrous metamorphosis of the fibrils was shown by the mallory and Van Gieson stains.

The venous congestion is manifested by:—

(a) Markedly dilated venous sinuses, as judged by actual measurements in comparison with normal spleens.

(b) Frequency of para-malpighian haemorrhages suggesting back-pressure on the ellipsoids. Fibrosiderotic nodules, which are the ultimate result of these haemorrhages, could only be seen macroscopically in 10 per cent of the spleens removed.

(c) The frequency of endophlebitic changes in the veins of the spleen.

Details of the histological picture obtained by various techniques as well as the histology of the spleen of experimentally infected animals will be published later.

A part of these studies was carried out at the Medical Unit, University College, London, by the courtesy of Dr. McKnee.

2.—*Malarial Splenomegaly*.—Some malarial spleens for this study could be investigated at the Hamburg Tropic-Institut by the courtesy of Prof. Nauck. Spleens removed at various periods from monkeys infected with malaria (*plasmodium knowlensi*) were also examined for the purpose of studying the stages of development of the chronically enlarged spleens.

Results of these investigations will be published in due course.

3.—*Changes following Splenectomy*, as described in the previous report, are still under investigation.

Some of the results obtained are summarised in the following:—

(a) No changes in the liver functions were found after splenectomy. The cirrhotic process usually remains stationary unless the Bilharzial infection is still active, when it will progress to a fatal issue (2 cases).

(b) Marked and persistent leucocytosis with lymphocytosis follows the operation, setting in very early and suggesting that the leucopenia met with in some of these cases is not the result of deficient formation of leucocytes. This is supported by the bone-marrow studies of such cases which show an active leucopoietic tissue.

(c) No significant improvement in the blood picture follows splenectomy, suggesting that the anaemia in these conditions is related mostly to the intestinal lesions (Bilharzial infestation) and the subsequent gastric disturbances.

(d) No significant changes were found in the blood urea, cholesterol and bilirubin levels. Reduction of the blood uric acid was noticed in some cases, as previously reported. Changes in the plasma proteins are still under investigation.

(e) *A gradually increasing macrocytosis developed after splenectomy in every case.*—The mechanism of this occurrence is still under investigation.

(f) Decrease of the previously normal fragility of erythrocytes is found in most cases.

4.—*Haematological Studies on Bilharzial Hepato-Lienal Fibrosis* have been carried out. A summary of the results obtained is given in the Clinical Report.

D.—STUDIES ON JAUNDICE

122 cases of jaundice were submitted to various investigations, the results of which will be published later. The following points will be discussed:—

1.—Comparative study of various liver function tests has shown that the galactose blood sugar curve is superior to other tests in detecting parenchymatous jaundice. It is more delicate than the galactose urine test of Bauer.

2.—The so-called catarrhal jaundice group was found to include three types with different mechanisms:—

(a) The purely parenchymatous type.

(b) Parenchymatous with cholangitis (descending).

These two types constitute the majority of cases.

(c) *A duodenal type.*—Although this is denied by some European workers, its existence in Egypt is definitely demonstrated. Intestinal parasitism may be a predisposing factor for its occurrence in Egypt. Criteria for its separation from the other types have been worked out. This separation is not only of physiological pathologic value but it helps both prognosis and treatment.

3.—Haematological studies in these jaundice cases have demonstrated the constant occurrence of macrocytosis during the icteric period. The relation of this phenomenon to the various biochemical changes in the blood, the changes in the liver functions, changes in the bone-marrow as well as its response to various therapeutic measures will be discussed in a special publication.

4.—Cases of jaundice occurring during salvarsan treatment were submitted to various investigations including the Abelin test (rate of excretion of salvarsan in urine,) as well as the effect of further administration of the drug, for the purpose of studying the etiological relation of salvarsan to jaundice. Results will be published when sufficient data are available.

E.—ACTION OF ANTIMONY ON THE LIVER

Continuing the previously published work on this subject, the biochemical and histological changes in the livers of guinea pigs injected with Fouadin, were studied in collaboration with the Biochemical Section.

Details of the experiments are outlined in the report of the Biochemical Section. The histological changes showed that congestion is the cause of the enlargement of the liver found in guinea pigs, as well as that found previously in rats under Fouadin treatment. No evidence of parenchymatous changes and fatty degeneration could be demonstrated. For the latter frozen sections stained with Sudan III were studied.

F.—INOCULATION MALARIA

Inoculation with malaria by the direct method (injecting blood intravenously) was carried out in 11 cases, showing various manifestations of nervous syphilis, as well as in 3 cases of post-encephalitic Parkinsonism.

The three species of malaria parasites were used for inoculation :

<i>Plasmodium vivax</i>	...	...	...	...	...	...	7 cases
<i>Plasmodium malariae</i>	...	...	...	...	...	...	4 „
<i>Plasmodium falciparum</i>	...	...	...	...	...	...	3 „

Details of the observations made, as well as of the investigations of the changes occurring in the organism during this treatment (haematological, biochemical, liver functions, etc.), will be published when sufficient data are available

In addition to this inoculation malaria is being studied in comparison with Pyrifar therapy

SECTION III.— Helminthological and Protozoology Section

TREMATODE INFECTION AMONG SNAILS

Research was continued to find the larval stages of the Egyptian trematode fauna in fresh water snails. For this purpose, several collections of snails from the vicinity of Cairo were obtained and examined for mature and immature stages and experiments were carried out to determine their life history:—

The collections comprised:—

1.—*Schistosoma* carriers *Bullinus* and *Planorbis* from Marg and Matarieh and the water stream of the Cairo Zoological Gardens. These were brought during the spring and summer months and invariably showed mature cercariae of *Schist. haematobium* and *Schist. mansoni* respectively. Infection varied with the season, it reached its maximum during the months of June, July and August when 20 per cent of the *Bullinus* and 50 per cent of the *Planorbis* were heavily infected.

Other larval trematodes met with in these snails were described in the preceding reports (1932, 1933 & 1934) and separate publications.

2.—*Limnea caillaudi* snails were collected from the Zoological Gardens and from a drain at Monaiar near Abu Zaabal.

The first group showed heavy infection in almost 90 per cent of the snails collected with a large *Xiphidocercaria* of the polyadenous group of Sewell (1932), with a typical stylet and a globular excretory bladder.

These cercariae were found to encyst in the mother sporocyst and in other non-operculated snails, tadpoles and fresh water crustacea of the genus *Palaemonetes*. Encystation took place readily in all these secondary intermediate hosts and development continued in the cyst for ten days after encystation. Mature cysts were fed to *Clarius* fishes and the free metacercariae were seen in the intestine. Further development were not observed owing to the death of the fish.

30 per cent of the *Limnea* snails collected from Monaiar showed infection with a *Xiphidocercaria*. This was different from the above-mentioned cercaria in morphology and seems in agreement with the description given by Sewell for cercariae indicae number XVII.

It did not encyst in the mother sporocyst but encystation took place readily in the crustacean *Palaemonetes* and tadpoles.

Metamorphosis took place in the cyst and was complete in 10 to 15 days, the excretory bladder assuming the shape of a T, the stylet is also markedly different from the previous species. (Details will be published when the experiments are complete).

3.—*Melania tuberculata* snails were collected from a pond near the Pyramid Road, Giza, and also from the Dakhla Oasis and Damietta. A schistosomatid cercaria and a *Xiphidocercaria* from the collection of the Oasis were previously recorded. The development of the latter was found to take place in *Anopheles* mosquitoes and the adults were found in bats collected from the same locality and proved to be *Lecithodendrium pyramidum* Looss, 1896. (Further details will be published separately).

In the *Melania* snails collected from the ponds near the Pyramid Road the following cercariae were found:—

(a) *Gymnocephalus* cercaria developing in rediae. They encyst in the muscular and soft tissue of the mother snail but not in the rediae. They also encyst in other snails put with the infected ones. (Further development is still under investigation).

(b) Another *Gymnocephalus* cercaria, the body of which showed marked cystogenous glands. It was found to encyst in the livers of the fish *Telapia nilotica* and in the livers of tadpoles. (Further development is still being studied).

(c) *A. C. pyramidum*, the *Xiphidocercaria* recorded from the *Melania* of the Oasis.

(d) A *Pleurolophocercous* cercaria which was found in large numbers in almost 70 per cent of the snails.

Since the discovery of the life history of Kasr *pleurolophocerca* Khalil; 1928 and *H. heterophyes* by the same author in 1932, extensive investigations were carried out to find the larvae of the other members of *Heterophyidae* commonly met with in Egypt and to see if any different distinctive morphological features could be found in the various cercariae.

It was also thought necessary to ascertain the relation between these larvae and those of the *Opisthorchidae* and *Clonorchidae*. Experiments with the cercariae found in this locality were carried out. They were found to encyst in the muscles of the fish *Telapia nilotica* and *Gambusia affinis* which proved to be a good medium for experimental purposes. Metamorphosis in the cyst was complete in 15 days. The fish was fed to cats and dogs bred in the laboratory, where the animals were sacrificed, 7 days later, numerous *Pygidioopsis gerata* Looss, 1907 were found in the intestine.

Morphologically these cercariae were different from those of Kasr as described by Khalil in the arrangement of the sub-ventral glands found in the parenchyma of the body of the cercariae. (Details of the work will be published later).

EXPERIMENTAL INFECTION OF VARIOUS LABORATORY ANIMALS WITH SCHISTOSOMIASIS

The object of the work was :—

1.—To determine the nature of the changes due to the presence of worms and ova.

2.—To determine the tissue reactions before and after the deposition of eggs.

3.—To determine the difference in the reaction of different animals to the two types, *Schist. haematobium* and *Schist. mansoni*.

4.—To find easily obtainable laboratory animals giving reaction to *Bilharzia* infection similar to that in man.

5.—To study the effect of treatment on and changes following it, in the tissues of these animals.

A series of experiments were conducted on several animals to establish infection with both species of *Bilharzia*. The route chosen was the cutaneous one; the animals being exposed for different periods to water containing large numbers of cercariae. In some cases the infection was produced by injecting water containing a given number of cercariae subcutaneously.

The animals used were white rats, guinea pigs, rabbits, hedgehogs, field mice, monkeys and gerbilles.

The last three, in contrast to all the others, were found to pass the ova in the excrements and, therefore, they were chosen for experiments on treatment. (Further details of this work will be published separately).

SECTION IV.—Medical Entomology

The work carried in this section falls under the following headings:—

1.—Identification of Insects sent to the Research Institute.

2.—Supervision of the work of the Khanka Malaria Research Station.

3.—Supervision of the work of the Filaria Station at Kafr Ghattati.

4.—Field work.

5.—Research Problems.

IDENTIFICATION OF INSECTS SENT TO THE RESEARCH INSTITUTE

(a) *Flies.*

The Director of the Giza Memorial Ophthalmic Laboratory sent 303 flies, caught on the eyes of patients attending the hospital from the 23rd of May to the end of September 1935.

All these flies belonged to the Genus *musca* except one fly which belonged to the Genus *Desmometopa*.

The following table gives the percentage and sex distribution of the species of *musca* found:—

Species	Female	Male	Total	Percentage in Specimens examined
				%
<i>Musca sorbens</i>	127	19	146	48·3
„ <i>vicinia</i>	89	13	102	33·8
„ <i>domestica</i>	29	0	29	9·6
„ <i>nebulo</i>	21	4	25	8·3
Total	226	36	302	—

Musca sorbens breeds in cow dung and in human excrement, especially in isolated patches around camps. In Mesopotamia it is supposed to be an important transmitter of the organisms which cause diseases of the eye.

The collaboration of the Giza Memorial Laboratory with the Research Institute is greatly desirable in order to establish some facts on the important question of the relation of flies to eye disease in Egypt.

(b) *Mosquito Larvae.*

During the year 1935, 4,733 samples of water containing mosquito larvae were sent to the Research Institute for identification.

The samples were sent from the following places.

1.—Malaria Research Station at Khanka ...	2,602
2.—Cairo Health Inspectorate	341
3.—M.O.H. of the Provinces	527
4.—Malaria Stations at Ismailiah, Aswan, Edku, Fayoum, etc.	1,005
5.—Filaria Station at Kafr Ghatatti	258
<u>Total</u>	<u>4,733</u>

Examination of mosquito larvae sent by the Cairo City Health Inspectorate revealed the presence of 13 species. The monthly distribution of these species is given in the following table.;

Species	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<i>Anopheles pharoensis</i> ...	—	—	—	4	—	3	6	5	7	13	4	3	45
<i>A. multicolor</i> ...	—	—	—	—	6	1	—	2	1	2	1	—	13
<i>A. mauritanus</i> ...	2	1	1	6	1	2	1	1	1	—	—	—	16
<i>Theobaldia longiareolata</i>	2	—	—	1	5	3	—	2	3	—	—	—	16
<i>Uranotaenia unguiculata</i>	—	—	—	—	—	—	—	—	—	—	1	—	1
<i>Aedes caspius</i> ...	—	1	—	3	3	—	—	2	13	13	7	1	43
, <i>aegypti</i> ...	—	—	—	—	—	1	3	12	8	3	1	—	28
<i>Culex pipiens</i> ...	14	5	—	2	11	3	4	9	56	31	11	2	148
, <i>perexiguus</i> ...	1	1	—	10	3	4	6	16	29	11	14	3	98
, <i>laurenti</i> ...	—	—	—	6	2	1	1	1	7	—	6	3	27
, <i>Laticinctus</i> ...	—	—	—	—	—	2	2	1	10	1	4	2	22
, <i>pusillus</i> ...	—	—	—	1	—	—	2	—	—	2	—	—	5
, <i>quasigelidus</i> ...	—	—	—	—	—	2	—	—	—	—	—	—	2

From the above one may conclude that the Anopheline species breeding in Cairo, and its suburbs are *Anopheles pharoensis*, *Anopheles multicolor*, and *Anopheles mauritanus*.

Anopheles pharoensis is the most prevalent species in this collection. The maximum breeding Season is in the Summer and Autumn. The breeding places are mainly in the suburbs of Cairo such as Ezbet El Nakhl, Ain Shams, El Matarieh, El Zeitoun, El Kobbah, Shubra, Embaba, El Dokki, El Giza, Old Cairo, Tura, Maadi and Helwan.

The favourite breeding places of *Anopheles pharoensis* in the suburbs of Cairo are well-aerated clean large pools, and borrow pits in which there is a thick growth of weeds and reeds. (In rural areas it is mainly found in rice fields and rice drains).

Anopheles pharoensis readily enters houses and bites man. It is a malaria carrier, and thus in undertaking Anti-malaria measures, preference should be given to abolish the breeding place of this mosquito.

The larvae of *Anopheles multicolor* have been collected from Shubra, Old Cairo, El Marial, Giza and Tura. The adult is known to breed all the year round, but the seasonal prevalence is from May to November. The favourite breeding places are salty pools and swamps with or without vegetation. At the Institute it was possible to breed larvae in normal saline. In my experience the adult seldom enters house and does not readily bite man, and so far has not been found infected with malaria.

Anopheles mauritanus was mainly collected from El Orman Gardens at Giza. The adult breeds all the year round. The favourite breeding place is the reedy well-shaded edges of small water channels. It enters houses and bites at night but so far has not been found infected with malaria.

Aedes aegypti is distributed all over Cairo. Specimens were collected from Giza, Matarieh, Shubra, El Helwieh, El Abbassia, El Zamalek, El Gezira, Kasr el Aini and Sayeda Zenab.

The favourite breeding places are small collection of water in houses or gardens. The actual breeding places from which the larvae were collected are earthenware filters (Zeers), small water tanks, barrels in gardens and water tins placed under the legs of tables to protect them from ants.

Aedes aegypti is a purely domestic mosquito. It readily bites man by day and night. In view of the development of aerial transport, facilities should be given to examine water collection in houses and gardens. Strict measures should be taken to eradicate the breeding places of this mosquito, especially those in the neighbourhood of aerodromes.

The following table shows the seasonal distribution of mosquito larvae sent by the M.O.H. of the provinces:—

Kinds	Months												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
<i>Anopheles multicolor</i> ...	4	2	—	—	—	2	—	—	1	8	8	1	26
<i>Anop. pharoensis</i> ...	1	1	1	—	1	—	—	—	—	—	4	11	19
<i>Anph. mauritanus</i> ...	—	—	—	—	—	—	—	—	—	2	—	—	2
<i>Aedes caspius</i> ...	—	1	23	3	—	1	3	4	8	8	6	4	61
<i>Theobaldia longiareolata</i>	2	—	33	3	—	—	1	—	—	1	—	—	40
<i>Uranotaenia unguiculata</i>	2	—	3	—	—	—	—	1	—	—	5	3	14
<i>Aedes aegypti</i> ...	—	—	—	—	—	—	—	—	—	1	—	—	1
<i>Culex pipiens</i> ...	31	12	131	16	8	3	12	12	36	23	40	26	350
„ <i>perexiguus</i> ...	2	2	9	2	1	—	—	6	4	17	36	10	89
„ <i>laurenti</i> ...	1	2	16	1	—	—	—	1	—	3	3	8	35
„ <i>pusillus</i> ...	2	—	1	—	—	1	2	—	—	—	1	—	7

The locality distribution of the breeding places of the above-mentioned Anophelines and *Aedes aegypti* are as follows:—

A. pharoensis was collected from Toukh, Kaluib, Belha, El Kanater el Khairia and Suez. *A. multicolor* was found in Toukh, Kaliub, Benha, Mansoura, Rashid and Suez.

A. mauritanus and *Aedes aegypti* were found in Mansoura. The latter was breeding in a water barrel.

The prevalent Anophelires are *A. multicolor* and *A. pharoensis* while the most prevalent culicine is *Culex pipiens*. The larvae may be found all the year round.

The number of specimens sent from the Malaria Stations in the Provinces is 1,005. The following table gives the monthly distribution of the different species:—

Kinds	Months												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
<i>Anopheles multicolor</i> ...	2	6	1	11	—	2	3	20	11	18	26	18	118
<i>Anophi pharoensis</i> ...	5	—	1	2	1	2	13	33	17	13	11	9	107
<i>Anoph. mauritanus</i> ...	—	—	2	—	—	—	3	2	—	—	5	2	14
<i>Anoph. sergenti</i> ...	—	4	—	—	—	—	—	1	—	—	—	8	13
<i>Aedes caspius</i> ...	1	5	—	17	—	1	6	8	2	11	40	26	117
<i>Theobaldia longiareolata</i>	—	—	14	6	—	1	—	—	—	—	2	—	23
<i>Uranotaenia unguiculata</i>	—	1	2	—	—	—	—	—	1	—	12	7	23
<i>Aedes aegypti</i> ...	—	—	—	—	—	—	1	2	—	—	—	—	3
<i>Culex pipiens</i> ...	6	18	12	2	—	1	37	4	5	12	35	64	196
„ <i>laurenti</i> ...	—	1	—	4	—	1	16	26	14	22	26	18	128
„ <i>perexiguus</i> ...	1	—	1	8	1	1	4	9	10	17	32	20	104
„ <i>pusillus</i> ...	—	2	—	2	—	—	1	3	—	2	13	8	31
„ <i>quasigelidus</i> ...	—	—	—	—	—	—	1	2	—	—	—	1	4
„ <i>tipuliformis</i> ...	—	—	—	—	1	—	—	—	—	—	—	—	2
„ <i>laticinctus</i> ...	—	—	—	1	—	—	—	—	—	—	—	—	1

From the above table it will be noted that the prevalent Anophelines are *Anopheles multicolor* and *Anopheles pharoensis*.

The following table gives the locality distribution of the above-mentioned specimens:—

Locality	<i>Anoph. multicolor</i>	<i>Anoph. pharoensis</i>	<i>Anoph. mauritanus</i>	<i>Anoph. sergenti</i>	<i>Aedes aegypti</i>
Ismailiah ...	95	76	12	4	2
Kantara ...	3	1	—	—	1
Zagazig (El Korain) ...	11	—	—	—	—
Edfina ...	5	11	2	—	—
Edkou ...	15	2	—	—	—
Gabares ...	1	6	—	—	—
Shibrakheit ...	2	2	—	—	—
El Fayoum ...	26	9	—	9	—
Aswan ...	20	—	—	—	—
TOTAL ...	118	107	14	13	3

It will be noted that *Anopheles multicolor* and *Anopheles pharoensis* are more widely distributed than the rest.

Aedes aegypti was found breeding in an earthenware filter (Zeer) at Ismailiah.

Owing to the importance of the Ismailiah zone, sketch map No. 1 has been prepared to show the breeding places of the different species of mosquitoes.

CLINICAL REPORT

1 — Out-Patients

Treatment of Bilharziasis with Fouadin.

The examination of every patient for Bilharziasis, whether urinary or intestinal, is carried out as a routine by examination of urine and stools. Rectal swabs and sigmoidoscopic examinations are resorted to in some cases. Patients found to be infected with *Bilharzia* are treated with Fouadin, while those suffering from other diseases are either treated as in-patients or kept under observation as out-patients during the treatment.

The dosage of Fouadin.—The course adopted was changed as follows :—

For an adult (60 kilos or more) the first dose is 3·5 c.c. The second to fifth doses are given daily and are of 5 c.c. each. The sixth to ninth doses are given on alternate days and are of 5 c.c. each.

Incidence of Infection with the Two Species of Bilharzia in the Urinary and Intestinal Tracts :—

Schistosoma haematobium in the urinary tract only ...	3,484
Schistosoma haematobium in the urinary and intestinal tracts	229
Schistosoma haematobium in the urinary tract and Schistosoma mansoni in the intestinal tract ...	163
Schistosoma haematobium in the intestinal tract only	79
Schistosoma mansoni in the intestinal tract only ...	177
Both, Schistosoma haematobium and mansoni, in the urinary tract and Schistosoma haematobium in the intestinal tract	2

Both, <i>Schistosoma haematobium</i> and <i>mansoni</i> , in the urinary tract and <i>mansoni</i> in the intestinal tract ...	18
<i>Schistosoma haematobium</i> in the urinary tract and both <i>Schistosoma haematobium</i> and <i>mansoni</i> in the intestinal tract	24
Both <i>Schistosoma haematobium</i> and <i>mansoni</i> in the urinary tract only	4
Both <i>Schistosoma mansoni</i> and <i>haematobium</i> in the intestinal tract only	10
<i>Schistosoma mansoni</i> in both urinary and intestinal tract	2

Results of Treatment of Bilharziasis by Fouadin :—

The total number of cases found infected with Bilharziasis	4,192
Number of cases who did not attend and complete a course of treatment	2,254
Total number of patients treated	1,938

A.—Cured after 9 injections... ..	1,028 i.e. 53%
(1) Re-examination results after one month	135 neg. & 14 pos.
(2) Re-examination results after two months	53 „ & 14 „
(3) Re-examination results after three months	23 „ & 1 „
Number of patients who stopped after 9 injections ...	173

B.—Cured after 11 injections	404
(1) Re-examination after one month... ..	52 neg. & 7 pos.
(2) Re-examination after two months.. ..	23 „ & 15 „
(3) Re-examination after three months	— „ & 1 „
Number of patients who stopped after 11 injections	96

C.—Cured after 13 injections	129
(1) Re-examination after one month	8 neg. & 2 pos.
(2) Re-examination after two months	10 „ & — „
(3) Re-examination after three months	3 „ & — „
Number of patients who stopped after 13 injections ...	16

D.—Cured after more than 13 injections	...	...	...	67
Re-examination results after one month	5 neg.	&	1 pos.	
Still positive after more than 13 injections	...	...	20	

(See Table No. I).

Treatment of Ancylostoma Infection with Carbon Tetra Chloride.

The dose of C.T.C. used is 5 c.c. to the adult weighting 60 kilos, taken with Magnesium sulphate.

Patients are re-examined after 1 week, 1 month, 2 months, and 3 months from taking the drug:—

(1) Total number of patients found infected with Ancylostoma	...	...	...	...	...	...	...	1,858
(2) Patients who did not attend for treatment or present themselves for examination after 1 week from purge	...	...	...	...	...	...	...	1,018
(3) Patients treated	...	...	...	...	...	...	...	840

Results of Treatment:—

A.—Cured after first dose	...	...	...	...	...	...	389
Re-examination results after							
1 month	...	...	...	...	...	44 neg. & 11 pos.	
Re-examination results after 2 months	25	,	&	5	,		
Re-examination results after 3 months	2	,	&	—	,		
Patients who stopped after first dose...	...	...	...	...	...	198	
B.—Cured after second dose	...	...	...	...	...	...	131
Re-examination results after							
1 month	...	...	...	...	...	19 neg. & 1 pos.	
Re-examination after 2 months	...	...	9	,	&	—	,
Stopped after second dose	...	...	...	...	...	35	
C.—Cured after third doses	...	...	...	...	...	...	38
Re-examination results after 1 month	5 neg.	&	— pos.				
Re-examination results after 2 months	1	,	&	—	,		
Stopped after third dose	...	...	...	...	...	21	

D.—Cured after fourth dose	...	...	...	...	...	...	7
Re-examination results after							
1 month	...	...	...	...	...	2 neg. & — pos.	
Still positive after 4 months	...	3	„	& —	pos.		

(See Table No. 2).

Treatment of Ascaris with Ascaridol.

Drug.—Ascaridol was given in a dose of 1.5 c.c. for the adult weighing 60 kilos.

Number of patients found infected with Ascaris	...	...	1,296
Number of patients who did not attend the treatment or examination after first dose	...	...	630
Number of patients treated	...	...	666

Results of Treatment :—

A.—Cured after 1st dose	...	...	...	...	...	615
Re-examination after 1 month	100	neg. & 3	pos.			
Re-examination results after						
2 months	...	33	„ & —	„		
Re-examination after 3 months	3	„ & —	„			
Stopped after first dose	...	...	...	...	...	31
B.—Cured after second dose	...	...	...	...	...	15
Re-examination results after						
1 month	...	3	neg. & —	pos.		
Re-examination results after						
2 months	...	1	„ & —	„		
Stopped after second dose	...	...	...	...	...	3
C.—Cured after third dose	...	...	...	...	...	2
Re-examination results after						
1 month	...	1	neg. & —	pos.		

Mixed infection with both Ascaris and Ancylostoma. Treated with a Mixture of Carbon Tetra Chloride and Oil Chenopodium.

The mixture is made of equal quantities of C.T.C. and oil Chenopodium, each 2.5 c.c. It is given with a dose of magnesium sulphate.

(1) Total number of patients found infected	...	...	...	922
(2) Absentees (did not attend treatment or present themselves for examination)	...	...	...	491
(3) Number of patients treated and examined	...	...	...	431
A—Cured after first dose	...	...	...	206

Re-examination Results.

Re-examined after 1 week and found still negative	...	28
Re-examined after 1 week and found positive	...	10
Re-examined after 1 month and found negative	...	4
Those who stopped further treatment	...	115
B—Patients cured after second dose	...	58

Re-examination Results.

Re-examined after 1 week and found negative	...	4
Those who stopped and did not continue treatment	...	25
C—Patients cured after third dose...	...	14
Patients stopped and did not continue	...	10
D—Patients cured after fourth dose	...	3
Re-examined after 1 week and found negative	...	1

Treatment of Taenia saginata.

Treated by Extractum Filicis liq. adult dose 5 grams in capsules (each 0.5 gms.).

(1) Number of infected patients	...	81
(2) Number of patients did not attend for treatment or examination	...	43
(3) Number of patient treated and examined	...	38
A—Number of patient cured after first dose	...	35
B—Number of patients cured after second dose	...	1

Re-examination results.

Re-examination after 1 week for those cured from first dose 10 neg.
1 pos.

Re-examination after 1 month for those cured from first
dose 4 neg.
1 pos.

Re-examination after 2 months for those cured from first
dose 1 neg.

The patients cured after second dose, returned after one month
and found neg.

Enterobius Vermicularis Infection.

Treated with Carbon Tetra-chloride is the usual form and dose
of treatment of Ancylostomiasis.

Total number of infected patients	...	...	...	...	...	391
Absentees	...	...	...	...	...	193
Treated patients	...	...	...	...	...	198
Cured after first dose	...	...	...	...	...	174
Re-examined after 1 week	...	...	...	...	33 neg. 4 pos.	
Re-examined after 1 month	...	...	...	...	7 neg.	
Re-examined after 2 months	...	...	...	...	5 neg.	
Stopped after first dose...	...	...	...	...	...	10
Cured after second dose	...	...	...	...	...	12
Re-examined after 1 week and found negative	...	...	...	...	...	2
Cured after third dose	...	...	...	...	...	1
Stopped after third dose	...	...	...	...	...	1

Trichostrongylus Infection.

Most usually found in combination with Ancylostoma infection.

Treated with Carbon tetrachloride

Total number of infected cases	...	...	...	...	...	484
Absentees	...	...	...	...	...	375
Treated patients	...	...	...	...	...	109
Cured after first dose	...	...	...	...	...	33
Returned after 1 week and found positive	...	...	...	...	...	1
Returned after 1 month and found negative	...	...	...	...	...	1
Stopped after first dose	...	...	...	...	...	53
Cured after second dose	...	...	...	...	...	11
Returned after 1 month and found positive	...	...	...	...	...	1
Stopped after second dose	...	...	...	...	...	5
Cured after third dose	...	...	...	...	...	1
Stopped after third dose	...	...	...	...	...	4
Cured after fourth dose...	...	...	...	...	...	2

Hymenolepis nana infection.

Treated with Extractum Filicis liq.

Adult dose like taenia is 5 grams in capsules each 0.5 gr.

Total number of infected cases	...	...	...	...	...	...	304
Absentees	...	...	...	...	...	...	26
Treated patients	...	...	...	...	...	...	37
Cured after first dose...	...	...	...	...	...	11	
Stopped after first dose	...	...	...	...	...	21	
Stopped after second dose...	...	...	...	...	...	1	
Cured after third dose	...	...	...	...	...	2	
Stopped after third dose	...	...	...	...	...	2	

Heterophys heterophys infection.

Treated with Extractum Filicis liq.

5

Total number of infected cases	...	...	...	...	...	...
(All treated).							
Cured after first dose	...	...	...	4			
Re-examined after first week	...	...	1	found neg.			
Re-examined after 1 month	...	...	1	„	„		
Re-examined after 1 month	...	...	1	„	„		
Stopped after first dose	...	...	1				

Trichocephalus infections.

Mostly in combination with Ancylostoma.

Total number of infected cases	...	...	...	...	...	...	42
Absentees	...	...	...	...	...	...	29
Treated cases	...	...	...	...	...	...	13
Cured after first dose	...	...	...	2			
Stopped after first dose	...	...	...	6			
Stopped after second dose	...	...	...	4			
Stopped after third dose	...	...	...	1			

Strongyloides infection.

Total number of infected cases	...	...	...	...	...	...	13
Absentees	...	...	...	...	...	...	12
Treated and found positive after 1st dose and stopped treatment	...	...	...	...	...	1	

Heterodera radiculicola was met with in 20 cases... ..

TABLE II.—TREATMENT OF HELMINTHIC INFECTION

Type of Infection	Results of Treatment															Total						
	Number of Treated Patients	1st Purge			Stopped	2nd Purge			Stopped	3rd Purge			Stopped	4th Purge								
		Cured	Re-examined			Still +	Cured	Re-examined		Still +	Cured	Re-examined		Still +	Cured		Still +					
			1 w	1 m				2 m				1 w						1 m	2 m	1 w	1 m	2 m
(1) Ancylostomiasis ...	840	389	44	11	25	5	2	—	—	—	—	—	—	—	—	—	310181858					
		46.3%																				
(2) Ascariasis ...	666	615	10	3	33	—	3	—	—	—	—	—	—	—	—	—	6301296					
		92.3%																				
(3) Ancylostomiasis and Ascariasis ...	431	206	28	10	4	—	—	—	—	—	—	—	—	—	—	—	491922					
		47.7%																				
(4) Oxyuris infection	198	174	33	4	7	—	5	—	—	—	—	—	—	—	—	—	193391					
		87.7%																				
(5) Trichostrongylus Infection ...	109	33	—	1	1	—	—	—	—	—	—	—	—	—	—	—	375484					
		3.2%																				
(6) Hymenolepis infection ...	37	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	267304					
		35%																				
(7) TaeniaSaginata infection ...	38	35	10	1	4	1	—	—	—	—	—	—	—	—	—	—	4381					
		92%																				
(8) Heterophyes infection.	5	4	1	—	1	1	—	—	—	—	—	—	—	—	—	—	5					
		80%																				
Trichocephalus infection.	13	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2942					
		15.3%																				
Strongyloides infection.	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1213					

NOTE: (i) Carbon tetrachloride is the drug used in treating Ancylostomiasis, and Oxyuris.

(ii) Ascaridol is the drug used in treating Ascariasis.

(iii) Mixture of carbon tetrachloride and oil chenopodium for Ancylostomiasis and Ascariasis.

(iv) Extraction felix max Liq. is used for taenia saginata, Hymenolepis nana and the rest of infection.

II.—Special Investigations

A.—ANAEMIAS

213 cases of anaemia were studied in the course of this year.

Helminthic Anaemias.

Of the 166 cases of helminthic anaemias studied, 124 were due to mixed infection and only 42 to infection with one parasite:—

Ancylostoma	...	...	...	13
Intestinal Bilharzia	...	...	...	16
Ascaris	...	...	...	5
Hymenolepis nana	...	...	...	2
Trichostrongylus	...	...	...	6

The *haemoglobin values* of these cases ranged from 8 to 50 per cent.

The *gastric secretion* was investigated in 64 cases with the following results :

Normal secretion	...	...	...	16
Hypersecretion	...	...	...	7
Hyposecretion	...	...	...	26
Achlorhydria	...	...	...	15 (Histamine positive 11). („ negative 4).

Cases free from Helminthic Infection.

In the following 47 cases no evidence of helminthic infection was found :—

Post-haemorrhagic Anaemia	...	12
Malarial Parasites (without fever)	...	13
Glandular Tuberculosis	...	3
Aleukaemic Lymphadenosis	...	2
Subleukaemic Reticulosis	...	2 (one with Gee's disease).
Anaemia associated with Pituitary Tumour	...	1
Idiopathic hypochromic Anaemia	...	12 (See Report of the Section of Experimental Medicine).
Undetermined Cases	...	2

The W.R. was positive in 7 cases (4 malarial, 1 idiopathic hypochromic, 2 post-haemorrhagic).

The *degree of anaemia* in these cases ranged from 15 to 60 per cent Hb.

Treatment.

A mixture containing 1·5 gram. ferriet ammon. citr. in each dose is given as a routine in any case showing a haemoglobin value below 50 per cent, before starting any anthelmintic treatment.

A rise in Hb. varying from 5 to 20 per cent per week results from this treatment.

Effect of Lecithin Rich Diet on Ancylostoma Anaemia.

(See Report of the Section of Experimental Medicine).

Trial of Congo Red Intravenously in Helminthic Anaemia.

(See Report of the Section of Experimental Medicine).

B.—HEPATO-SPLENOMEGALIES

Aetiological Analysis of Cases.

Total number	871
Number showing Evidence of Bilharzia	602
Urinary Bilharzia	355
Intestinal Bilharzia	87
Urinary and Intestinal Bilharzia	145
Bilharzia Cutaneous Reaction... ..	15
No Evidence of Bilharzia	269
Malaria (Benign Tertian)	44
Malaria (Malignant)	51
Typhoid Group	43
Syphilis	23
Parenchymatous Jaundice	7
Purpura Haemorrhagica	3
Paroxysmal Haemoglobinuria	3
Simple Achlerhydric Anaemia	7
Leukaemia	4
Subleukaemic Reticulosis	2 (one with Gee's Disease).
Von Jaksch's Anaemia... ..	2
Hodgkin's Disease	1
Tuberculosis	4

As the Bilharzia cutaneous reaction was not made in every case, the total of cases without evidence of Bilharzia may be smaller than given.

Splenectomy.

Splenectomy was performed in 39 cases during this year. The spleens removed were submitted to special investigations, the results of which will be published later.

As to the *Effect of Splenectomy*, see Report of the Section of Experimental Medicine.

Haematological Studies on Hepato-Lienal Fibrosis.—

For the proper understanding of the mechanism of various changes in the blood picture in this condition, the haematological findings in a group of such cases are compared with those of pure intestinal Bilharziasis without enlargement of the liver and spleen as well as intestinal Bilharziasis with enlarged liver.

Details of these findings will be reported later. The following is a short outline of the results obtained so far:—

(1) The *degree of anaemia* in this condition has no relation to the size of the spleen nor to the stage of the disease.

(2) It is more dependent on the degree of the gastro-intestinal derangement resulting from the Bilharzial infection of the intestine, being more severe with dysenteric cases, especially when associated with secondary gastric dysfunction. Severe dysentery may mask the degree of anaemia by producing dehydration with consequent blood concentration.

(3) The anaemia is usually of the *hypochromic type*. In a series of cases the Hb. values ranged from 20 to 90 per cent and the R.B.C. from 2 040 000 to 5 140 000. This shows that the degree of anaemia in this condition is less marked than in ancylostoma infection.

(4) The anaemia is generally of the *normocytic type*. Microcytosis is only present in cases complicated by ancylostoma infection. In spite of the constancy of hepatic cirrhosis no macrocytosis was ever found. Hepatic macrocytic anaemia was reported (Wintrobe) in cases of advanced cirrhosis. The absence of macrocytosis in the

condition investigated suggests that the cirrhosis does not affect the parenchyma of the liver to such an extent as to interfere with its storing the haemopoietic principle. Observation of more advanced cases may help to elucidate this statement.

Nevertheless, macrocytosis was constantly demonstrated to follow splenectomy in this condition. The mechanism of this phenomenon is still under investigation.

(5) The anaemia is of the *hypoplastic type*. The reticulocytic count ranged from 0·2 to 0·4 per cent. Higher reticulocytic counts suggest complication by haemorrhage (piles, haematemesis, epistaxis, etc.) or concomitant malarial infection.

(6) The anaemia is *non-haemolytic*. No evidence of increased haemolysis could be demonstrated in these cases; the icterus index varies from 2 to 5 units, higher figures suggest malaria or hepatic complication; no increase of urobilinogen excretion is met with in uncomplicated cases and no haemosiderosis could be found in the spleens removed by operation; Chemical estimation of iron in the removed spleens was carried out by the Biochemical Section and did not show any increase of iron except in spleens with many fibrosiderotic nodules.

The absence of haemolysis at all stages of the disease argues against the presence of any reticulo-endothelial hyperactivity as that found in malarial and leishmania hepato-splenomegalies.

(7) The *leucocytic count* was between 1 500 and 10 400. The statement of previous workers that leucopenia is a constant feature of Bilharzial hepato-lienal fibrosis is not supported by the findings in the present series, as it occurs only in about one-third of the cases being more common and constant with malarial hepato-splenomegaly. These leucopenic cases show leucocytosis after infections (pyelitis, etc.), haemorrhage and after splenectomy, suggesting that this leucopenia is not the result of deficient formation of leucocytes. The question is still being experimentally studied.

(8) Contrary to previous statements, *monocytosis* is constantly absent in Bilharzial hepato-lienal fibrosis. Its presence suggests malarial infection or subleukaemic reticulosis. This statement has been repeatedly confirmed using the suprarital technique of Sabin.

(9) The *effect of adrenalin* on the blood picture of these cases, before and after splenectomy, is under investigation and will be reported later.

(10) *Bone-marrow* obtained by sternal puncture from 38 cases was examined and showed :—

- (a) A normoblastic reaction corresponding to the degree of anaemia.
- (b) Increased leucopenia in all cases, including the leucopenic ones.
- (c) No increase of reticular cells. Such cells were found to be increased in the bone-marrow of some cases of malarial hepato-splenomegaly, 2 cases of subleucaemic reticulosis and 2 cases of hepato-splenomegaly due to congenital syphilis.

C.—MALARIA

123 cases of malaria were met with during this year. Some of these presented themselves with fever and rigors suggestive of malaria, while others were only detected in the course of the routine examination of thick drop and blood films carried out in every case with enlarged spleen.

Analysis of cases with Special Reference to Enlargement of Liver and Spleen :—

	No	Spleen	Liver +	Spleen & Liver +	Spleen & Liver —	W. R. or Kahn
Malignant Malaria	67	24	—	37	6	12
Benign Tertian ...	54	17	—	24	10	11
Quartan Malaria ...	2	—	—	2	—	1

This table shows that enlargement of the liver without enlargement of the spleen does not occur in malaria. Both liver and spleen are affected in more than half of the cases. The liver is enlarged in 55 per cent of the malignant and in 44 per cent of the benign tertian cases. The spleen is enlarged in 91 per cent of the malignant and in 81 per cent of the benign tertian cases.

This shows that both the liver and the spleen are more affected in malignant than in benign tertian malaria.

Malarial Hepatitis.

Cases presenting themselves with enlarged, tender livers are usually diagnosed and treated as amoebic hepatitis, on account of the frequency of amoebic infection. The previous table shows the significance of malaria in the causation of some of these cases. The presence of an enlarged spleen and the subicteric tint of the sclera should favour the diagnosis of malarial rather than amoebic hepatitis. The demonstration of leucopenia with or without malarial parasites in the blood film, confirms the diagnosis and directs the proper treatment.

Seasonal Incidence.

Out of the 123 cases of malaria 115 presented themselves in the second half of the year and only 8 attended during the first half. This corresponds to the incidence of malaria in endemic areas.

Treatment.

As a result of previous investigations on the treatment of malaria with Atebrin, as compared with Plasmoquine and quinine (under publication), the following course is adopted as a routine treatment of malaria in the Research Institute :—

Atebrin 1 tablet (0·1 gram) T.D.S. for 5 days.

If the daily examination of blood films shows persistence of parasites on the fourth day, the course is prolonged to seven days.

This course of Atebrin is sufficient for the treatment of most cases of benign tertian and quartan malaria, although we have some evidence from the few cases of quartan malaria met with, that they are slightly more resistant. It is, therefore, advisable to prolong the Atebrin course to 10 days in quartan cases.

As Atebrin has no action on the crescents of malignant malaria, the Atebrin treatment in such cases should be followed by a course of Plasmoquine (the latter being gametocidal). Plasmoquine Co., being less toxic than Plasmoquine simplex, is preferable (0·02 T.D.S. for 7 days). It is better to give Atebrin and Plasmoquine after one another than to give the two drugs at the same time.

This line of treatment has been followed in the Research Institute for the last three years. Untoward effects are rare. Those observed during this period are enumerated below :—

(1) Yellow coloration of the skin due to deposition of Atebrin. this occurred in about 40 per cent of the cases. It disappeared within 1–4 weeks and as it did not predispose to skin sensitization as observed with the allied drugs of the trypanflavine group, it is not to be regarded as being of any pathological significance.

(2) Some abdominal symptoms (colic and diarrhoea due to Plasmoquine).

(3) Two cases of severe haemolytic crises with oxy-and met-haemoglobinuria (*see* Report for 1934). Both cases recovered. The question whether these cases are examples of blackwater fever or the result of Plasmoquine poisoning, could not be definitely decided.

(4) An attack of cerebral irritation of two days duration followed an intravenous injection of 0.2 gram. Atebrin.

Inoculation Malaria.

See Report of the Section of Experimental Medicine.

D.—JAUNDICE

In the course of the year, 122 cases of jaundice were investigated. Three subdivisions of the so-called catarrhal jaundice could be separated.

- (1) Pure parenchymatous jaundice.
- (2) Parenchymatous jaundice with descending cholangitis.
- (3) Duodenal catarrh with ascending cholangitis.

The groups differ in prognosis and treatment.

Detailed investigations of the liver functions, blood picture and various treatments will be published later. (*See* Report of the Section of Experimental Medicine).

Five cases of obstructive jaundice were met with :—

- 1 due to ascariasis.
- 1 due to cancer of pancreas.
- 1 due to gall stones.
- 1 in Bilharzial hepato-lineal fibrosis with ascites, possibly due to Bilharzial pancreatitis.
- 1 with tuberculous peritonitis, probably due to pressure of tuberculous glands on the bile ducts.

No cases of haemolytic jaundice were encountered in this series.

E.—LEISHMANIASIS

Berberine Sulphate.

10 cases of Leishmaniasis were treated with Berberine sulphate according to the suggestion of Indian workers, the drug was injected locally in repeated doses.

Local reaction with swelling and inflammation occurred in 5 cases.

The nodules were found to be positive for parasites at the end of the treatment (in some cases from 6 to 10 injections were given) in 7 cases.

Diathermy.

Three methods of applying diathermy to the leishmania nodules were tried :—

(1) Complete excision of the nodule with the diathermy knife. 2 nodules were treated by this method. Secondary infection developed and the scarring was marked.

(2) Touching the nodule with the diathermy plate. (2 cases; the nodules shrank under this treatment and remained negative in one patient, while the other returned with new infiltrations at the periphery of the previously treated nodule (positive for parasites).

(3) Repeated puncturing of the nodule with the diathermy needle. This method was applied in 2 cases, one of them having a big nodule on the forehead, between the eyebrows. In both cases the nodules shrank remarkably and became negative for parasites. There was no scarring and no recurrence.

Accordingly, the last method is recommended.

F.—PELLAGRA

65 cases of Pellagra were studied during this year :—

(1) Only 4 cases were free from parasitic infection, while 61 were associated with various parasites.

(2) In spite of the frequency with which intestinal Schistosomiasis is associated with pellagra, the occurrence of splenomegaly is fairly rare in these cases. In the present series only 7 cases were found to have an enlarged spleen, which was felt only 1-3 fingers below the costal margin.

(3) 34 cases were associated with anaemia (all of them from the group with parasitic infections).

(4) Lateral sclerosis was demonstrated in 4 only, while increased deep reflexes were found in another 6 cases.

(5) Oedema is also uncommon in association with pellagra. It was only met with in 5 cases and was usually of a mild degree. In none of the cases with oedema could any manifestation of avitaminosis B. (Beri-beri) be detected.

(6) Examination of the gastric secretion by the alcohol-histamine method was carried out in 27 cases with the following results:—

Normal Secretion	...	...	...	...	...	...	3
Hyperchlorhydria	...	...	...	...	...	...	1
Hypochlorhydria	...	...	...	...	...	...	12
Achlorhydria	...	...	...	...	...	...	11

This shows that achlorhydria occurs in about one-third of the cases, thus confirming the previous findings reported from this Institute.

(7) The fallacy of interpreting the results of treatments of pellagra in the In-patients was previously pointed out (1933). Accordingly in trying the therap. effect of any drug controls without any treatment are kept on the same diet for comparison.

Vitaminol, a preparation containing various amino acids and Vitamin B, in tablets was administered to 9 patients on basal hospital diet (4 tablets daily).

Disappearance of rash, general improvement resulted after 3 to 4 weeks. The following shows the therapeutic effects of basal hospital diet, marmite and vitaminol:—

Therapeutic Procedure	Number of Cases	Time of Improvement
Basal Hosp. diet.	16	3-5 weeks
Marmite	11	1-3 „
Vitaminol	9	3-4 „

This shows that marmite is superior to other procedures in producing temporary recovery from the attack.

G.—DYSENTERY

Examination.

Patients complaining of dysenteric symptoms besides being examined clinically in full, have their stools examined microscopically and sygmoidoscopic examination done if possible. Bacteriological culture done if picture is suggestive of bacterial infection.

General Analysis of Cases.

The following is a general analysis of etiological factors met with in cases examined :—

Total number	290
 A.—Amoebic dysentery alone	68
(1) Amoebic dysentery with other protozoa	6
(i) With Giardia	2
(ii) With Trichomonas	4
(2) Amoebic dysentery with Schistosomiasis ...	12
(i) With Sch. mansoni	8
(ii) With Sch. haematobium ...	4
(3) Amoebic dysentery with Malaria (M.T.) ...	1
 B.—Bacillary dysentery	78
Shiga	3
Flexner	2
Morgan	2
Para colon	1
Catarrhal colitis diagnosed by sygmoido- scope (stool culture neg.)	54
Proctitis	2
Inflamed piles	2
T.B. enteritis	1
T.B. Peritonitis	2
Normal mucus membrane	9
 C.—Bilharzial dysentery	35
Schist mansoni... ..	15
Schist. haematobium	17
Schist. haematobium and mansoni	3

D.—Heterophys dysentery	2
E.—Other protozoa. Trichomonas and chilomastix mesnil	2
F.—Absentees	86

Amoebic Dysentery Cases.

(1) *Examination*.—Cases were diagnosed by stool examination, sygmoidoscopic examination done whenever possible, both before and after treatment.

(2) *Treatment*.—Cases were treated with { (a) Emetine A.
(b) Emetine only.

Patients who did not attend for treatment ...	16
Patients treated with Emetine A	38
Patients treated with Emetine only	33

TOTAL 87

See Table No. III for detailed results of examination and treatment.

BACILLARY DYSENTERY

Cases negative for amoebic dysentery which on sygmoidoscopic examination are suspected to be Bacillary dysentery, have their stools cultured. Some give a positive culture for pathogenic bacteria and others give a negative culture though the sygmoidoscopic picture is suggestive of bacterial infection, (i.e. diffuse congestion of membrane and sometimes ulceration).

Number of Cases	Stool Culture	Sygmoidoscopic Picture	Associated Clin.	Observation
3	Shiga	Diffuse congestion ...	—	—
2	Flexener	Congestion and ulceration	—	—
2	Morgan	"	—	—
1	Para colon ...	"	—	—
1	Typh. Bacilli	—	—	—
54	Negative	Diffuse congestion ...	Tender L++10 spastic colon 2	Treated with " Emetine A "
2	"	Proctitis	—	—
2	"	Inflamed piles	—	—
3	"	T.B. peritonitis 2 ...	—	—
		T.B. enteritis 1	—	—
9	"	Normal m.m.	Diarrhea	—
79	TOTAL			

Drugs used	Number of Cases	Diagnosis of Infection Present		Associated Clinical Manifest.	Result of Treatment		Re-exam.		Observation
		Stool	Sygm.		Stool	Syg.	No.	Result	
Emetine	10	Ent. Hist. ...	Ulcers +	Nil	Neg.	—	3	Neg.	Compl. treat. with E.B. 1.
A.	1	"	"	Nil	—	—	0	—	—
"	5	"	"	"	Neg.	—	0	—	1 vomited during the course
"	1	"	"	"	—	—	0	—	Compl. treat. with E.B. 1.
"	1	"	0	"	Neg.	—	0	—	—
"	1	" and Gardia	0	"	—	—	0	—	—
"	2	" and Trich.	0	"	—	—	0	—	—
"	1	" and Sch; man	0	"	—	—	0	—	—
"	2	" and Sch.haem	0	"	—	—	0	—	—
"	1	" veg. and cysts	—	Cholecys- titis	—	—	0	—	—
"	2	" and veg. only	—	—	—	—	Stopped treatment after 3 and 7 due to injection. Fainting.		
"	12	—	—	—	—	—	Did not continue treatment.		
Emetine	19	" hist.	Ulcers	L. +++ & T. (4)	Neg.	—	0	—	—
"	5	" and S.M.	—	Nil.	—	—	—	—	—
"	1	" and Trichom.	—	"	3+2	—	—	0	Compl. with E.B. 1.
"	1	" W.R. ++	—	"	—	—	0	—	—
"	7	—	—	"	—	—	—	—	—
None	8	Ent. his. only.	—	—	Did not complete the course.	—	Did not attend for treatment.		
"	2	" and S.m.	—	—	"	—	—	—	—
"	2	" and S. h.	—	—	"	—	—	—	—
"	1	" and Gardia.	—	—	"	—	—	—	—
"	1	" and Trichom.	—	—	"	—	—	—	—
"	1	" and M.T.	—	—	"	—	—	—	—
"	1	Syphilis (Kahn++++)	—	—	"	—	—	—	—

BILHARZIAL DYSENTERY

Treated with Fouadin :

Total number	35
Schist. mansoni	15
Schistosoma haematobium	17
Schist. haematobium ond mansoni	3

HETEROPHYES DYSENTERY

Treated with Extractum Filicis liq. Total number... 2

OTHER CONDITIONS

(1) Eighty-six cases complaining of dysenteric symptoms and found negative by direct stool examination and did not attend for further examination.

(2) Tow cases found positive for non-pathogenic protozoa (both have Trichomonas and chilomastix.

(3) One case found positive for typhoid Bacilli.

SYSTÉMATIC CLASSIFICATION OF VARIOUS DISEASES MET WITH IN THE CLINIC FEVERS.

Typhoid	12
Para A.	1
Para B.	7
Mixed	6
Small pox	2
Mumps	1
Erysipelas	1
Influenza	1
Unexplained pyrexias	12
Malaria	123
B.T.	54
M.T.	67
Elephantiasis	4
T.B. glands	1

Digestive System Diseases.

Gastric ulcer	...	...	...	...	1	
Denodenal ulcer	...	...	...	...	1	
Hyperchlorhydria	...	...	...	...	6	
Achylia	...	...	...	...	2	with Ancylostoma.
Chronic appendicitis	...	...	...	...	7	
Acute apper dicitis	...	...	...	...	1	
T.B. Enteritis	...	...	...	...	9	
Retroperitoneal Sarcoma	...	...	...	...	1	
Cholecystitis	...	...	...	...	26	
Diabetes Mellitus	11	3 with Polyneuritis.

Deficiency Diseases.

Pellagra	65	1 with nervous lesions.
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Endocrine Diseases.

Enlarged thyroid	13	adenomatous.
Infantilism	1	
Pituitary Tumour	2	

Respiratory System Diseases.

Tonsilitis	...	...	...	...	...	11	
Bronchitis	...	...	...	...	...	58	(Bilharzia + in 25).
Asthmatic Bronchitis	...	...	...	...	...	21	
Emphysema	...	...	...	...	...	18	
Pulmonary T.B.	...	...	...	...	...	34	
Enlarged hilar glands	...	...	...	...	...	3	(W.R. + in one).
Fibrosis of lung	...	...	...	...	...	2	
Paralysis of diaphragm	...	...	...	...	...	1	
Thickened pleura	...	...	...	...	...	4	
Pyopneumothorax	...	...	...	...	...	1	

Circulatory System Diseases.

Functional murmurs	...	...	...	...	...	162	
Mitral Disease	...	...	...	...	...	47	(W.R. + in 3).
Mitral and Aortic	...	...	...	...	...	4	
Aortic Disease	...	...	...	...	...	11	(W.R. + in 4).
Hypertension	...	...	...	...	...	43	
Hypotension	...	...	...	...	...	3	
Myocardial	...	...	...	...	...	6	(one with brundle branch block).

Auricular fibrillation	...	...	1	
Extra systoles	...	...	19	
Sinus Arrhythmia	...	...	3	
Bradycardia	...	...	2	(with parasites).
Tachycardia	...	...	12	
Congenital heart	...	...	3	(Interventricular communication).

Blood Diseases.

Anaemias	...	...	213	(166 with parasites and 47 without).
Leukæmia	...	...	4	
Purpra haemorrhagica	...	...	3	

Urinary System Diseases.

Pyelitis	...	...	20	= B. coli 10 (8 sterile, 5 evidence of Bilharzia).
Renal colic	...	...	36	= X-Ray, 6 cases = 2 stones of kidney, 1 stone of pelvis, 3 neg. 13 Bilharzia.
Prostate	×	...	27	= 7 M.T. & 20 B.T.
Bladder	...	...	12	= 5 cancer and 5 sarcoma and 8 Bilharzia and stones
Kidney	...	...	9	<div style="display: inline-block; vertical-align: middle;"> <div style="font-size: 2em; vertical-align: middle; margin-right: 5px;">{</div> <div> Tumour 2 Pyonephrosis 2 Hydroneph 1 Perinephric abscess 1 Movable kidney 3 </div> </div>
Cystitis	...	...	31	= 4 Bilharzia & 16 B. coli. 1 B typhosus. 1 B proteus. 1 B faecalis.
Vulva Bilharziasis	...	...	1	
Bilharzial Penis	...	...	8	
Incontinence	...	...	12	= 1 cysto-rectocele. 3 Bilharzia.
Testis	...	...	2	= 1 Tumour. 1 Elephantiasis of scrotum, Film neg.
Endem. fuinculitis	...	...	1	
Chyluria	...	...	2	
Haematuria (Bilh. neg.)	...	...	3	

Gonorrhoea	...	...	...	...	9	
Haemospermia	...	...	...	...	3	(No Bilharzia evidence).
Impotence	...	...	...	...	1	
Paraxyzm. haemogl.	...	...	...	...	3	(W.R. in all).

Nervous System Diseases.

Sciatica	...	...	...	...	10	(Neuralgic 8 Spondylitis 2)
Parkinsonism	...	...	...	...	6	(Post encephalitic 3 Paralysis agitans 3).
Hemiplegia	...	...	...	...	4	(Infantile 1 Thrombotic 3).
Hysteria	...	...	...	...	4	
Anterior Polyomyelitis	...	...	...	...	2	
Compression myelitis	...	...	...	...	1	(Potts').
Epilepsy	...	...	...	...	3	(one reappeared after Fouadin)
Facial paralysis	...	...	...	...	5	(Bell's).
Trigeminal neuralgia	...	...	...	...	1	(W.R. neg.).
Ulnar nerve lesion	...	...	...	...	1	
Myopathy	...	...	...	...	1	
Pituitary tumour	...	...	...	...	2	
Spinal syphilis	...	...	...	...	2	
G. P. I.	...	...	...	...	5	
Tabes dorsalis	...	...	...	...	4	
Lateral Sclerosis	...	...	...	...	4	(Post pellagic).
Undiagnosed	...	...	...	...	7	

Skin Diseases.

Scabies	...	...	...	...	40	
Dermatitis	...	...	...	...	6	
Taenia	...	...	...	...	3	
Leucodermia	...	...	...	...	8	
Urticaria	...	...	...	...	4	
Various	...	...	...	...	15	

Diseases of Bones and Joints.

Osteoarthritis	...	...	...	...	8	
Spondylitis (Cervical)	...	...	...	...	1	
Spondylitis (Lumbo sacral)	...	...	...	...	2	
Synovitis	...	...	...	...	2	
Kyphosis	...	...	...	...	1	

Veneral Diseases.

Syphilis	9
Gonorrhea	11

Gynaecological Cases. 13

Surgical Cases.

Hernia	6
Piles	13
Fistula in ano	4
Prolapse of rectum	1

List of Publications of the Staff during 1935

127. S. MADWAR.—Biology and Morphology of *Macrocera anglica* Published in "Psyche Vol. XLII, No. 1 (1935), pp. 26-34.
128. S. MADWAR.—Biology and Morphology of the Immature Stages of *Mycetophila Marginata* Winnertz and *Dynatosoma Suscicorne* MG. (Published in the Annals and Magazine of Natural History ser 10, Vol. XV, p. 108, January, 1935.
129. DR. A. HASSAN and Dr. M. SALAH.—The Action of Antimony of the Liver with Special Reference to its Use in the Treatment of Schistosomiasis. (Published in Archiv für Schiffs Und Tropen Hygiene Pathologie u. Therapie Exotischer Krankheiten Band 39, Heft I, 1935 pp. 1-13.
130. DR. M. ABDEL AZIM.—On a Schistosomatid *Cercaria* from *Melania tuberculata* Muller 1774. (Published in the Journal of the Egyptian Medical Association, March 1935, Vol. XVIII, No. 3, pp. 174-179.
131. M. S. MARZOUK.—Malaria Research in Khanka District (Published in the Journal of the Egypt. Med. Association), April 1935, Vol. XVIII, No. 4, pp. 150-162.
132. M. KHALIK BEY.—A Discussion on Leishmaniasis in Egypt (Published in the Journal of the Egypt. Medical Association), Vol. XVIII, April 1935, No. 4, pp. 203-206.
133. DR. A. HASSAN and M. SALEH.—Investigation on Carbon tetrachloride Intoxication (Published in the Journal of the Egypt. Medical Association, Vol. XVIII, April 1935, No. 4, pp. 207-124
134. M. ABDEL AZIM.—The Epidemiology of Schistosomiasis in Egypt (Published in the Journal of the Egypt. Med. Association). Vol. XVIII, April 1935, No. 4, pp. 215-227.
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Administrative Report

1.—PERSONNEL

The personnel of the Research Institute and the Endemic Diseases Hospital, as sanctioned by the Budget of 1935-1936 are as follows :—

Number	Post	Grade	Remarks
1	Director	—	Voluntary Worker
1	Biochemist	4th	—
1	Parasitologist	4th	—
1	Medical Entomologist	4th	—
1	Clinical Pathologist	5th	—
1	Bacteriologist... ..	5th	—
5	Medical Officers	6th	—
1	Sanitary Engineer	5th	—
2	Clerks	8th	—
1	Hakim	7th	—
1	Moawin	Hors Cadre.	—
4	Molahez	" "	—
9	Laboratory Assistants... ..	" "	—
3	Nurses	" "	—
10	Male and Female Attendants ...	" "	—

2.—EXPENDITURE

The total expenditure during 1935 was 6,353,699 mills.

The details of the expenditure are as follows :—

	L.E.	M.
Salaries of Permanent Staff... ..	3,560	468
Salaries of Hors Cadre Staff	1,086	367
Transport, Travelling Allowances and Expenses	22	300
Food of In-patients and Employés	240	755
Food of Experimental Animals	70	539
Gas, Light and Water	313	527
Telegrams and Telephone	14	525
Equipment, Furniture and Laboratory Materials	775	894
Uniforms	8	—
Petty Expenses	243	375
Books and Journals	6	678
Purchase of Experimental Animals	11	271
TOTAL	6,353	699

Visitors :—

- (1) Prof. Vollhard.
- (2) Prof. Todd.
- (3) Prof. Keysser.

During the year, the Institute and Hospital were visited by distinguished people, amongst them were the above-mentioned professors.

Organisation of the Khanka Malaria Research Station

The work carried out in this Station includes the following :—

- 1.—Field work.
- 2.—Work carried out inside the Station.

1.—FIELD WORK.

A topographical description of the area controlled by the Khanka Malaria Research Station has been given in the Fourth Annual report of the Research Institute and the Endemic Diseases Hospital for 1934.

The mosquito survey of the area revealed the presence of the following species, which is tabulated in the following table according to their seasonal prevalence.

TABLE I.—GIVING THE MOSQUITO LARVAE SENT TO THE RESEARCH INSTITUTE FOR IDENTIFICATION FROM KHANKA

Kinds	Months												
	1	2	3	4	5	6	7	8	9	10	11	12	
<i>Anopheles pharoensis</i> ...	14	12	9	14	40	42	164	—	—	—	—	—	295
<i>Anopheles multicolor</i> ...	40	19	25	46	28	30	25	—	—	—	—	—	213
<i>Anopheles mauritianus</i> ...	2	1	1	3	2	—	1	—	—	—	—	—	10
<i>Aedes caspius</i> .	42	74	74	62	12	22	58	—	—	—	—	—	344
<i>Theobaldia longiareolata</i> ...	4	10	16	10	2	7	1	—	—	—	—	—	50
<i>Uranotaenia unguiculata</i> ...	2	2	4	3	2	—	—	—	—	—	—	—	13
<i>Culex pipiens</i> .	125	126	162	126	134	119	120	—	—	—	—	—	912
„ <i>perexiguus</i> ...	27	17	32	52	27	32	83	—	—	—	—	—	270
<i>Culex laurenti</i> .	4	5	44	24	23	18	45	—	—	—	—	—	163
„ <i>pusillus</i> ...	17	12	4	12	11	3	3	—	—	—	—	—	62
„ <i>quasigelidus</i> .	—	—	—	—	2	3	5	—	—	—	—	—	10
„ <i>laticinctus</i>	—	1	—	1	2	—	—	—	—	—	—	—	4

From the above table the following conclusions may be drawn :—

(1) The prevalent anopheline mosquito larvæ are :—

Anopheles pharoensis and *anopheles multicolor*. These two species have not been found in the same breeding place. *Anopheles pharoensis* is a purely or nearly fresh water breeder, whereas *anopheles multicolor* prefers salty water.

(2) The most prevalent Culicine is *Culex pipiens*. The favourite breeding places of this mosquito are wells and deep Sakia pits.

The following table gives the locality distribution of the mosquito larvæ collected from the area controlled by the Khanka Malaria Research Station (see also Map 1) :—

TABLE II

Locality	Anopheles			Theob. Long.	Uranot. Unguic.	Aedes casp.	Culex					
	Phar.	Maur.	Mult.				Pus.	Lati.	Quas.	Perx.	Iau.	Pip.
Khanka	—	—	2	7	—	10	—	—	—	5	1	43
Arab el-Ayaida.	13	—	3	2	—	8	1	—	1	6	—	44
Gebel el-Asfar farm	5	—	9	—	—	4	—	—	—	1	1	15
Abu-Zaabal Pri- son	6	—	3	—	—	6	2	—	—	6	4	4
El-Minaya ...	5	—	2	—	—	6	—	—	—	6	3	40
El-Akrasha ...	18	2	1	1	—	11	—	—	—	3	9	7
Rail Workshops	7	—	6	1	—	12	2	—	—	9	4	19
Mershaka ...	9	8	1	—	—	4	—	—	3	15	7	5
El-Minayar ...	7	—	2	—	—	1	—	—	—	1	3	9
Sindiwa	21	—	8	4	1	24	—	1	—	7	17	39
El-Manayel ...	13	—	—	2	—	12	—	—	—	8	11	32
Kafr Hamza ...	2	—	2	1	—	6	—	—	—	6	1	34
Saryakous ...	47	—	8	9	1	18	2	—	3	30	15	25
Teftish el-Prin- cisa	18	—	16	3	2	18	6	—	—	16	11	54
El-Alag	22	—	10	5	1	10	2	—	1	13	11	36
Old Teftish el- Princisa ...	13	—	18	—	2	26	8	—	1	6	9	11
Ezbet Harhour	10	—	27	3	1	29	6	2	—	14	8	55
El-Birka village and Ades farm	16	—	54	1	4	26	16	1	—	21	7	90
Kafr el-Shorafa.	6	—	9	—	1	10	3	—	—	6	9	12
El-Marg	11	—	20	1	—	34	10	—	—	16	12	60
El-Khosous ...	27	—	13	5	1	45	4	—	—	51	11	131
Abu-Zaabal ...	19	—	—	5	—	24	—	—	1	25	9	47
	295	10	213	50	13	344	62	4	10	270	163	912

TABLE III.—SHOWING THE NUMERICAL PREVALENCE OF MOSQUITO LARVAE COLLECTED FROM THE VARIOUS TYPES OF BREEDING PLACES OF THE AREA

Types of Breeding Places	Anoph. pharoensis	Anoph. maurit.	Anoph. mult.	Theobal.	Uranotaenia	A. caspius	C. pusillus	C. lat.	C. Quas.	C. per.	C. Leau.	C. pip.
Rice cultivation	54	—	6	—	—	6	—	—	2	14	28	1
Sakias	2	—	7	17	—	21	3	—	—	12	1	287
Wells	1	—	—	11	—	26	—	—	—	7	2	243
Miska (small irrigation channels)	68	—	7	1	1	26	—	—	3	37	26	27
Drains	85	9	47	7	4	82	13	1	3	66	55	54
Burrow pits	3	—	1	—	—	8	—	—	—	4	7	8
Birkas and swamps	38	—	29	2	1	29	6	—	1	52	16	57
Sand quarry pits	5	—	4	—	—	7	1	—	—	11	2	8
Small pits	33	1	102	7	6	119	28	2	1	61	24	98
Water tanks and barrels	1	—	—	4	—	3	1	1	—	3	—	33
Sewage tanks and channels	1	—	1	—	—	1	2	—	—	—	—	46
Palm and other cultivation	4	—	9	—	—	6	4	—	—	3	2	4

2.—WORK CARRIED OUT INSIDE THE STATION

In 1935, the Khanka Malaria Research Station devoted all its activities to the examination of the malaria patients only. Patients suffering from the helminthic infections were sent to hospitals near-by.

Malaria surveys of some of the important Government institutions were continued in order to study the epidemiology of malaria and to determine the mosquito vector. Studies on the relation of rice cultivation on the spread of malaria were extended. Prophylaxis with anti-malaria drugs were carried out in six Ezbas to determine the efficacy of Quinine, Plasmoshine and Atebrine and to study their action on the prevention of relapses.

TABLE IV.—GIVING THE NUMBER OF BLOOD SPECIMENS EXAMINED FOR MALARIA AT THE KHANKA STATION FOR THE LAST 5 YEARS (see PARAGRAPH 1)

Year	Specimens examined	B.T. Pos.	%	M.T. Pos.	%	Total B.T. & M.T.	%	Remarks
1931	1,932	—	—	—	—	150	11	A case of quartan malaria was detected in 1933 and 1935.
1932	1,684	—	—	—	—	91	5·4	
1933	4,586	272	5·9	43	0·9	316	6·8	
1934	8,674	686	7·9	50	0·5	736	8·4	
1935	20,000	1,984	9·9	1,109	5·9	3,094	15·5	

From the above table, as well as Graph 1 the following may be noted :—

(1) The number of the blood films examined in 1935 is almost 3 times the number examined in 1934.

(2) The percentage of the positive films for malaria in 1935 was 15·5, as compared with 8·4 in 1934. The reasons for this increase will be discussed later.

The following table gives the number of films examined by the Station from various sources :—

TABLE V

Places from which Films were sent	Number	Pos. for Malaria	%
Outpatients attending Khanka	2,791	969	34·7
Films from contacts	693	9	1·3
„ by the tents (subsidiary stations)	4,396	1,531	34·8
„ from infants (done as a survey) ...	756	1	0·13
„ „ the Ezbas... ..	4,545	193	4·3
„ „ the schools	582	17	2·9
„ „ the hospitals	2,356	94	3·9
„ „ Abu-Zaabal Prison	755	13	1·7
„ „ the Reformatory of Boys ...	447	7	1·5
„ „ Abu-Zaabal Loco-shops... ..	241	5	2·7
Re-examined malaria patients of 1934 ...	163	34	20·8
Films sent from the Research Institute.	500	58	11·6
Other specimens	1,775	163	9·6
TOTAL	20,000	3,094	15·5

From the above table the following may be noted :

The percentage of malaria is high among the outpatients and films sent from tents. This is due to the fact that mainly malaria patients were admitted for examination. The tents acted as subsidiary stations and were of great help in sending films from distant places which were heavily infected. Re-examination of malaria patients of 1934 showed a high percentage of relapses.

Locality Distribution of Malaria.

The villages from which specimens were examined are divided according to their relation to the Station into two divisions: (1) Those inside the area supervised by the Station. (2) Those outside the area.

From those inside 17,339 were examined, of which 2,189 were positive, i.e. 12·6 %, and from outside the area 2,661 films were examined, of which 905 were positive, i.e. 33·9 %.

The following table, as well as Graph 2, shows the percentage of malaria in the villages under the supervision of the Station:—

TABLE VI

Village	Number Exam.	B.T. Pos.	%	M.T. Pos.	%	Total Pos.	%	Remarks
El-Minaya ...	213	8	3.7	2	0.9	10	4.6	A case of quartan malaria was detected at Abu-Zaabal.
El-Khosous ...	465	18	3.8	10	2.1	28	5.9	
El-Birka ...	543	21	3.8	12	2.2	33	6	
Abu-Zaabal ...	1,534	60	3.9	34	2.2	95	6.1	
El-Khanka ...	3,839	186	4.8	54	1.4	240	6.2	
Kafr Ebian ...	521	33	6.3	4	0.7	37	7	
„ el-Shorafa...	545	32	5.8	7	1.2	39	7	
El-Marg ...	1,291	78	6	19	1.4	97	7.4	
Al-Alag ...	1,892	119	6.3	32	1.6	151	7.9	
Saryakous ...	1,840	132	7.1	41	2.2	173	9.3	
El-Minayar...	102	7	6.7	4	3.8	11	10.5	
Kafr Hamza ...	1,223	249	20.3	40	3.2	289	23.5	
El-Manayel...	870	173	19.8	38	4.3	211	24.1	
Sindiwa ...	2,461	413	16.7	362	14.7	775	31.4	
Outside the area	2,661	455	17	450	16.8	905	33.9	
TOTAL...	20,000	1,984	9.9	1,109	5.5	3,094	15.5	

From the above table the following may be noted:—

(1) The high percentage of malaria in Kafr Hamza and Sindiwa due to the increase of the rice cultivation in these villages. The relation of rice cultivation to malaria will be discussed later.

(2) The average percentage of malaria in the area outside the control of the Khanka Malaria Station is almost 3 times the average percentage in the area controlled by the Station. This reflects on the effort of the Khanka Station in controlling the disease and the efficacy of its control measures.

Monthly Distribution of Malaria.

The following table, as well as Graph 3, shows the number examined and the percentage of malaria in the different months of the year 1935:

TABLE VII

Month	Number examined	B.T. Pos.	%	M.T. Pos.	%	Total Pos.	%	Remarks
January ...	770	19	2.5	11	1.4	30	3.9	
February ...	858	12	1.4	6	0.7	18	2.1	
March ...	1,407	38	2.7	3	0.2	41	2.9	
April ...	1,323	30	2.2	—	—	30	2.2	
May ...	1,068	74	6.9	2	0.2	76	7.1	
June ...	1,551	109	7.0	1	0.1	110	7.1	
July ...	1,827	158	8.6	9	0.5	167	9.1	
August ...	1,517	367	24.1	40	2.7	407	26.8	
September ...	2,761	561	20.3	345	12.5	906	2.8	
October ...	2,440	402	16.5	298	12.2	701	28.7	
November ...	2,340	144	6.1	269	11.5	413	17.6	I quart. mal.
December ...	2,138	70	3.3	125	5.9	195	9.2	
TOTAL ...	20,000	1,984	9.9	1,109	5.5	3,094	15.4	

The table and the graph show that the percentage of malaria in general is lowest in February and increases gradually till it reaches its maximum in September, decreasing again till next February. This gradation was not seen in April and June, because in each of these two months about 400 new-borne infants and pupils were examined. As these generally have a low percentage of malaria, so the general percentage in the two months was apparently low.

It is seen also from this table that the benign malaria begins to increase from February reaching its summit in August, while malignant malaria increases gradually from May to September and October, thus following exactly its name (Estivo-Autumnal).

In a next paragraph discussing the relation of malaria to mosquitoes, it will be seen that the malaria season coincides with the anopheline season.

New Infection and Relapses.

One of the characteristic features of malaria infections is the occurrence of relapses. In the class of outpatients attending the Khanka Station it is difficult to distinguish between new infections

and relapses from histories given by patients. For this reason, infants less than one year of age were examined. This gives an indication of the incidence of fresh infections in the area.

The following table gives the monthly percentage of malaria of infants in the area in comparison to the percentage of malaria in the outpatients:—

TABLE VIII

Month	Number of infants	Positive Cases		% of Fresh Infection in Infants	% of Malaria in Outpatients	Difference between % of Malaria in Infants and Outpatients
		B.T.	M.T.			
January	—	—	—	0	3.9	+ 3.9
February	—	—	—	0	3.3	+ 3.3
March	7	—	—	0	8.8	+ 8.8
April	10	—	—	0	15.6	+15.6
May	10	1	—	10	17.8	+ 7.8
June	26	3	—	12	22	+10
July	28	4	—	14.2	23.2	+ 9
August	35	7	—	20	43.8	+23.8
September	28	7	—	25	56.4	+31.4
October	26	3	2	19	60	+41
November	26	2	1	12	51.2	+39.2
December	10	1	—	10	34.7	+24.7
TOTAL	206	28	3	15	34.7	19.7

From the above table it will be seen that if the general percentage of malaria in the outpatients, which is 34.7, is taken to represent both new infections and relapses, and the percentage of malaria in infants is taken to represent fresh infections only, then the percentage of relapses would be 19.7. If we apply this ratio to the general percentage of malaria in 1935 which is 15.5, then we get 6.7 % of cases as new infections and 8.8 % of cases as relapses.

The cause of the high percentage of relapses is to be attributed to the following:—

- (1) Inefficiency of anti-malaria drugs in giving a permanent cure.
- (2) Liability of patients to stop anti-malaria drugs as soon as clinical symptoms subside.

Malaria in Relation to Age.

Owing to the importance of knowing the percentage of malaria in different ages the following table is given (see also Graph 5):—

TABLE IX

Age	Number examined	Number positive	Percentage
Less than 2 years	1,620	164	10
From 2 to 10 years	3,801	665	17
„ 10 to 20 „	3,921	638	16
More than 20 „	10,658	1,627	15

From this table we see that:—

164 patients were less than 2 years, *i.e.* 5·3% of all cases.

665 „ „ from 2 to 10 years, *i.e.* 21·4% of all cases

638 „ „ „ 10 to 20 „ „ 20·7% „ „

1,627 „ „ more than 20 „ „ 52·6% „ „

Malaria in Relation to Mosquitoes.

To verify this relationship cheap glass traps were distributed among the assistants and other persons interested in catching mosquitoes. By this means 9,816 mosquitoes were caught, of which 3,802 were anopheline. Graph 4 shows the number of mosquitoes caught per month, as compared to the monthly incidence of malaria. It will be seen that the malaria season coincides with the anopheline season but comes a little later, because the cycle of malaria in the mosquito takes about 2 weeks so that the mosquito becomes infective.

Another observation shows this relationship more clearly. The first anopheline brought to the Station was in April, and the first case of a fresh infection in infants was in May. If we consider the incidence of malaria in infants we find that no positive infection was found during the first 4 months of the year (see Table VII).

Relation of Malaria to Atmospheric Temperature.

We notice also from the above-mentioned Graph 4 that there is also some relation between the spread of malaria and the atmospheric temperature, which was represented for every month by the average

of maximum temperature taken daily. But this relation between malaria and temperature does not go strictly hand in hand; it seems that the effect of this latter is only to stimulate the growth of the mosquito in its different stages; it is known for example that the larva during summer needs only about a week to complete its development, while during winter this period was extended to several weeks. Also the malaria parasite itself needs during summer less days than it needs during winter to complete its cycle in the stomach of the mosquito and reach the salivary glands. From what we have mentioned one concludes that the rise of atmospheric temperature helps in the spread of malaria by two means: first, by hastening the growth of the mosquito in its different stages and consequently increasing its number; second, by increasing the percentage of the infected mosquitoes as it shortens the period which the parasite needs to complete its stage in the mosquito and so gives more chance for the mosquitoes to live till they become infective.

But the effect of the atmospheric temperature does not stop short here, as it is noticed that we get more relapses in summer than in winter or, in other words, many cases of malaria that have occurred in a previous year and left without treatment or with incomplete treatment tend to relapse in the following summer. This we know by considering the percentage of malaria in the outpatients who are less than one year as being the amount of fresh infection, and by deducting it from the general percentage of malaria in the outpatients we get the amount of relapses. Thus, we find that this amount while not exceeding in January for example 3.9 %, yet it reaches in August 23.8 % and in September 31.4 %.

It seems that this is one of the arrangements of nature which it does to maintain the species by preparing and increasing the parasite in the period (season), in which the transmitting insect also appears and increases.

Enlargement of the Spleen in Malaria.

Splenic enlargement is one of the characteristic physical signs of malaria infection, but apart from its clinical value as a diagnostic sign it is of considerable value in judging the epidemicity of malaria within a region. In the area supervised by the Khanka Station, bilharzia is widespread and thus the results in the following two tables are given with some reserve.

The following two tables show the monthly percentage of malaria and enlargement of the spleen in the outpatients of the different villages and in the different months:—

TABLE X

Village	Percentage of Malaria	Percentage of Spleen
Kafr el-Shorafa... ..	—	—
El-Manayel... ..	21·8	9·3
El-Khanka... ..	22	16
Abu-Zaabal... ..	22·1	34·3
El-Birka... ..	25	25
Kafr Ebian... ..	27·1	24
El-Khosous... ..	29	26·8
Kafr Hamza... ..	33·1	24·3
Sindiwa... ..	34·4	19·4
El-Minayar... ..	36·3	31·8
El-Alag... ..	37	25·4
Saryakous... ..	37·2	24·9
El-Minaya... ..	38·3	23
El-Marg... ..	48	54
Outside to area... ..	53·8	51·8

TABLE XI

Month		
January... ..	3·9	1·8
February... ..	3·3	7
March... ..	8·8	8
April... ..	15·6	5·4
May... ..	17·8	3·1
June... ..	22	6·1
July... ..	23·2	11·6
August... ..	43·8	34
September... ..	56·4	52
October... ..	60	56
November... ..	51·2	49·6
December... ..	34·7	45·6

It will be seen from the above tables that the percentage of splenic enlargement tends on the whole to run parallel with the percentage of malaria but at a lower level.

We endeavoured to find if the benign or the malignant malaria produces more enlargement of the spleen; so we took from among the outpatients of September 100 patients with benign tertian malaria

and we found in them 79 cases of enlarged spleen, and we took also 100 patients with malignant malaria and found in them 82 cases of enlarged spleen. This does not show any marked difference between the two forms of malaria from this point; and in fact, as we have mentioned in the report of last year, we did not notice any clinical difference between them. All the 2,791 outpatients were examined for enlarged spleen. 800 were found positive and 969 had malaria and 671 from these were positive for both malaria and spleen. This shows that in the area of the station out of 100 cases of malaria there are 69 with enlarged spleen, and out of 100 cases of enlarged spleen there are 84 cases with malaria. I must mention here that I have considered the case to be positive for spleen when this was found to be larger than normal, even if it was not felt except under deep inspiration.

Work carried out by Tents.

To facilitate the work carried by the Khanka Station, tents were sent to some distant villages in the area. Each tent was in charge of a trained malaria surveillant, who undertook local malaria survey of a limited area. By this means it was found possible to examine people who were unable to attend at the Khanka Station. Moreover, a study of housing and economic conditions in relation to malaria was made.

Practical demonstrations of anti-malaria schemes were made by the medical officer and the people used to flock to the tents for treatment.

The following table shows the work carried out by the tents:—

TABLE XII

Place of Tent	Examined	Positive of Malaria	Percentage
El-Marg	183	6	3·3 % February and March.
Kafr Hamza	1,407	488	34·1 % May to November.
Sindiwa	2,257	932	41·3 % August to December.
Arab el-Sawalha	376	94	25 % October to November.
El-Khosous... ..	173	11	6·3 % November.
TOTAL	4,396	1,531	34·8

Malaria in Gabal el-Asfar Farm.

One of the Government Institutions found in the area of the Station is Gabal el-Asfar farm which is important from the point of view of malaria, owing to the excessive number of its drains and the occasional appearance of seepage water in which anopheline mosquitoes breed and consequently help in the spread of malaria. Nevertheless the specimens taken from the farm gave a lower percentage of malaria than that of any other village in the area. Out of 366 persons examined 13 were found positive, giving a percentage of 3.6 %. Out of that number 43 presented themselves to the Station as being sick and 9 of them were positive; and the remaining 323 specimens were brought from the Ezbas of the farm and gave 4 positive cases. This satisfactory result is due to care taken in controlling all the breeding places found in the farm and thoroughly treating all the labourers of the farm, who were compelled to take a full course of treatment if found positive for malaria.

During the period of the flood the director of the farm complained from the appearance of seepage water in some places. The complaint was sent to the Research Institute which communicated with the Irrigation Department that sent special machines for deepening the main drain, causing a strong flow of water towards it, thus preventing the appearance of seepage water in low places.

Abu-Zaabal Prison and the Reformatory for Boys.

We tried to examine as many persons as possible from Abu-Zaabal Prison and the Reformatory for Boys in Marg, aiming for the most part to study in the positive cases the effect of atabrin in preventing relapses, as the prisoners were found the most suitable for this purpose.

755 specimens from the prison were examined with 13 positives, giving a percentage of 1.7 % and from the reformatory 447 specimens were taken (nearly all the boys) 7 cases were positive for malaria, giving a percentage of 1.26 %. These were treated with atabrin as well as some of the patients of the prison, and we hope to examine them in 1936 to know the effect of the drug on the relapses.

It may be worth mentioning here that the malaria in the above-mentioned 20 patients was latent, i.e. they did not complain from any symptom of the disease.

Malaria in the Lunatic Asylum at Khanka.

This hospital received much care from the Station during the year 1935. In spite of examining the specimens taken from cases suspected to be malarial, or from the new patients of the hospital to be sure that they are free from malaria, in spite of these specimens

which were 309, the Station examined also all the patients of the hospital who were 2,044 in number and gave 23 positive cases in whom the malaria was latent, *i.e.* without apparent symptoms and so no specimens were sent from them before that. Out of the 309 specimens sent by the hospital there were 40 positive cases in the hospital of which 5 were from Tamargis, so all the positive cases were 63, 39 of which were benign tertian and 24 malignant.

We are going here to compare between the malaria in this hospital in the last 3 years. But as the whole number of the patients was examined only during this year, so in making this comparison we must consider only the positives of the specimens sent from the hospital. The following table shows the number and percentage of the positive cases together with the general percentage of malaria in the area of the Station.

TABLE XIII

Year	Number of Patients of the Hospital	Number of Positives	Percentage of Positives	General Percentage of the Area
		%	%	%
1933	1,814	11	0·6	6·8
1934	1,931	20	1	8·4
1935	2,044	40	1·9	15·5

From this table we see that the increase in the percentage of malaria in the hospital is nearly in the same proportion with the increase in the whole area of the station, and even if we consider the whole number of the positive cases discovered in the hospital which is 63, the percentage of malaria will be 3% which is lower than that of any of the villages belonging to the Station.

It is worth mentioning that most of these cases of malaria were new and not relapses (this we knew from their observations sheets). We tried to know the breeding places of the anopheline mosquitoes necessary for this new infection, but we could not find any inside the limits of the hospital.

But owing to the presence of the drains of Gabal el-Asfar farm near the hospital towards the east and north, we believe that the necessary mosquitoes came to it from these drains.

Rice Cultivation and Malaria.

One of the difficulties in the way of combating malaria in the area controlled by the Khanka Station is rice cultivation. There are over 1,000 feddans cultivated rice in the Khanka area. It is possible to substitute another crop instead of rice in most cases, but in some cases it was found that rice cultivation is more beneficial to the land in order to wash the salts in the areas that have not been under cultivation before. This is the case in the low-lying area facing the Birkah village which was swampy before the erection of the Alag pump. No rice was cultivated in Sindiwa previously, but since the completion of a new canal 3 years ago which run at a high level, seepage water began to appear in the low-lying area and the people had to cultivate rice instead.

Both the sowing and the transplantation method of rice cultivation are carried out in the area. The former is much more widespread.

An. pharoensis was found breeding in both cases.

The mosquito fauna of rice fields and drains are *An. pharoensis*, *Culex perexigunus* and *culex laurenti*.

The following table gives the percentage of malaria in villages in which rice was cultivated :—

TABLE XIV

Villages	Persons examined	Percentage of Malaria	Benign Tertian	Malignant Tertian
		%	%	%
Abu-Zaabal... ..	1,534	6·1	3·9	2·2
El-Manayel... ..	870	24·1	19·8	4·3
Kafr Hamza	1,223	23·5	20·3	3·2
Sindiwa	2,461	31·4	16·7	14·7
El-Minaya	213	4·6	3·7	0·9
Saryakous	1,840	9·3	7·1	2·2
El-Marg	1,291	7·4	6	1·4
Kafr el-Shorafa... ..	545	7	5·8	1·2
TOTAL	9,977	17	11·5	5·5

The following table shows the percentage of malaria in villages in which rice was not cultivated :—

TABLE XV

Village	Persons examined	Percentage of Malaria	Benign Tertian	Malignant Tertian
		%	%	%
Khanka	3,839	6.2	4.8	1.4
Kafr Ebian	521	7	6.3	0.7
El-Minayar	102	10.5	6.7	3.8
El-Alag	1,892	7.9	6.3	1.6
El-Khosous... ..	465	5.9	3.8	2.1
El-Birka	543	6	3.8	2.2
TOTAL... ..	7,362	6.8	5.3	1.5

It is seen from these two tables that the percentage of malaria in the villages that cultivated rice is 17% while in the rest of the area it is only 6.8%, a difference which shows clearly the danger of rice cultivation in causing a spread of malaria.

The following table shows the relation of rice cultivation to the spread of malaria in 1934 and 1935 in the villages of the area :—

TABLE XVI

Village	Rice cultivation in Acres during 1934	Rice cultivation in Acres during 1935	Difference	Percentage of Malaria during 1934	Percentage of Malaria during 1935	Difference
				%	%	%
Abu-Zaabal	30	117	87	4.9	6.1	1.2
Sindiwa	70	269	199	13.6	31.4	17.8
El-Manayel	15	35	20	40.7	24.1	19.4
El-Marg	300	549	249	5.8	7.4	1.6
Kafr el-Shorafa	90	90	—	—	7	—
El-Minaya	—	2	2	5.2	4.6	0.6
Saryakous	—	4	4	9.3	9.3	—
Kafr Hamza	—	18	18	10.2	23.5	13.3
TOTAL	505	1,084	579	10	17	7

We notice from this table that with the increase of rice cultivation from 505 acres to 1,084 acres, the percentage of malaria also increased from 10 to 17 %.

To exclude any doubt that this increase in the percentage of malaria is due to the increase in the area of rice cultivation and not due to a general increase in the whole area, we compared between the percentage of malaria this year and the previous year in the villages that did not cultivate rice. We found that the percentage was 6.9 and became 6.7% in the year 1935, that is the malaria decreased there. Thus, we can say that the percentage of malaria in the locality could be decreased easily if we stop the rice cultivation which proved evidently that the dangers caused by it are more than the benefits gained from it.

It should be mentioned that out of 1,048 acres of rice cultivation mentioned above, there are 180 cultivated Dineba (a species of grass used for grazing), which has the same effect from the point of view of malaria as the rice, as it remains flooded with water during the whole period of cultivation. From this amount there are 170 feddans at El-Marg and 10 at Kafr el-Shorafa.

Control Measures.

During the year 1935 labourers and foremen carried out a great deal of control work inside the area. There were about 30 men belonging to the Station, 4 of whom for oiling and dusting the breeding places, 4 for clearing Gabal el-Asfar drains, and two travelling with the tents. The rest of the labourers were engaged in filling and drainage works under the supervision of the Research Institute Sanitary Engineer. But owing to the limited supply of money this last group was discharged at the end of October 1935.

The following is a brief account of what has been done either by the Station or by other Departments:—

(a) *Irrigation Department Drains.*—El-Khosous drain which passes through el-Khosous village and then joins Belbeis drain was dug by the Irrigation Department. It helped to drain most of the Birkas in that vicinity and also reduced the level of the ground water and made it easier to fill the remaining bodies of water.

(b) *Drains dug by the Labour Corps of the Station :—*

- (1) The labourers dug a drain 400 metres long to join Birket El-Gabbana which is situated to the east of Saryakous and Belbeis drain.

The water level of the Birka was thus lowered and its area became one acre instead of $2\frac{1}{2}$ acres. Also the continuous flow of water towards Belbeis drain made the breeding of larvae in the pond more difficult.

(2) The labourers dug also another drain 200 metres long to join between Birket Abu Dunia, situated to the south of Kafr Ebian and Gabal el-Asfar drain. The Birka which is about one acre became dry and was cultivated. But the drain could not be kept afterwards in a good condition and so it was pipe-drained.

(3) The labourers made also in the swamps to the north of El-Birka many small drains, all about 2 kilometres long, that discharge in Belbeis drain. They dried many of the pits found there and at the same time the mud that was thrown out from the drains was used in filling the rest of the pits.

(4) Also in Gabal el-Asfar farm the labourers dug many small drains, about 1 kilometre long, that discharge in the main drain and help in drying the low lands.

(c) *Places filled by Other Departments than the Station.*—After some correspondence between the Research Institute and the Railways Department, the latter filled in some pits belonging to it, situated to the south of Abu-Zaabal Prison (about 1,650 square metres) as well as other pits situated to the north of Abu-Zaabal Station, as it was proved that these pits were breeding places for anopheline larvæ.

Also the Institute communicated with the same Department when the workmen of the Railways Workshops at Abu-Zaabal complained from the excessive number of mosquitoes in their houses during April, and it was proved that some of it bred in 3 swamps situated to the east of the houses. The Railways Department then filled 2 of these swamps (about 500 square metres). The third was filled by the Station.

(d) *Places filled by the Labour Corps of the Station.*—About 11,850 square metres of breeding places were filled by the labourers of the Station in the different parts of the area. Nearly all belonged to the Government.

(e) *Places filled by their Owners at the Request of the Station.*—About 13,000 square metres of the breeding places were filled by their owners after being asked to do that by the Station, as those places were found to breed anopheline larvæ.

(f) *Places cleared of their Weeds by the Labour Corps of the Station.*—Many drains, swamps and Birkas were cleared of their weeds by the labour corps of the Station in different parts of the area.

(g) *Places cleared of their Weeds by their Owners at the Request of the Station.*—Many drains and Miskas were cleared of their weeds by their owners after finding the anopheline larvæ in them.

(h) *Places to which Gambusia affinis Fish was transferred.*—This fish was put in 8 wells, 15 Sakias, 2 Birkas and some drains.

Paris Green, and Mazout Oil used in the Year 1935.

(1) *Paris Green.*—170 kilograms of this powder were used. These become 17,000 after mixing them with fine oven dust in the proportion of 1 : 100. It is either dusted over by machine gun dusters or by the hand according to circumstances and to the kind of breeding places.

If we suppose that 10 grams of the mixture are used for every square metre then the above-mentioned amount must have been used for an area of 1,700,000 square metres, and as the process of spraying is repeated weekly so we can say that the breeding places of anopheline mosquitoes only (because if there is also culex larvæ mazout, oil is used) amount weekly to an area of 32,700 square metres. This number appears small, as compared to the vast areas of breeding places spread here and there and amounting to about 480,000 square metres, but this we can explain by the fact that most of the breeding places contain also culex larvæ, either alone or together with anopheline larvæ, and so are sprayed with mazout oil.

(2) *Mazout Oil.*—The great majority of the breeding places is sprayed with this oil as it is used wherever culex larvæ are found, either alone or together with anopheline larvæ. 5,960 kilograms were used, as well as about 1,040 kilograms of the previously used oil which the station brought from the loco-shops of Abu-Zaabal during a period in which no mazout oil was found in the P.H. Stores. Thus about 7,000 kilograms were used (together with a big amount of the oil of the loco-shops which was taken and used for the breeding places near them).

The mazout oil is generally sprayed with special pumps. It is understood from the pamphlet distributed by the Department that for every square metre of water one must use half a kilogram of the oil, but we have found by experience that 100 grams are quite sufficient. So we can say that the above-mentioned amount was used to cover 70,000 square metres during the whole year, *i.e.* 1,400 square metres weekly.

Cases of Filarias.

The Station paid some attention towards this disease by examining all the blood films for the microfilaria together with the malaria parasite, and also by making a comparison between the percentage of microfilaria in specimens taken by day and those taken at night.

The specimens examined were 20,000, of which 226 were positive for microfilaria, *i.e.* 1.13 %. Out of that number 18,390 were taken by day, of which 131 were positive for microfilaria, *i.e.* 0.7 %, and 1,610 were taken at night, of which 95 were positive for microfilaria, *i.e.* 5.9 %. This shows the difference between taking the specimens at night and by day when examining for filariasis.

In spite of the presence of such a number of cases positive for microfilaria, yet we did not notice a single case of elephantiasis in this locality. But we have noticed that many cases of filariasis complain of some sort of intermittent fever (as they say) that appears at night which we used to doubt whether it is malaria, till it was proved by microscopical examination that it is not so.

We find below a table that shows the number of persons examined in every village and the number and percentage of positive cases. This is shown also in the joined Graph 11.

I should like to mention that the villages numbered 1, 2, 3, 5, 6, 8, 9 and 15 were examined by day and at night also, but from the rest of the villages specimens were taken by day only.

TABLE XVII

No.	Village	Cases examined	Positives	Percentage %	Remarks
1	Kafr Ebian	521	40	7.7	Examined day and night
2	Kafr Hamza	1,223	49	4	
3	Saryakous	1,840	39	2	
4	El-Minaya	213	3	1.4	
5	Abu-Zaabal	1,534	15	1	Examined day and night
6	El-Khanka	3,839	26	0.7	
7	El-Manayel	870	6	0.7	
8	El-Birka	543	2	0.4	
9	Sindiwa	2,461	10	0.25	Examined day and night
10	El-Alag	1,892	3	0.16	
11	El-Minaya	102	—	—	
12	El-Khosous	465	—	—	
13	El-Marg	1,291	—	—	Examined day and night
14	Kafr el-Shorafa	545	—	—	
15	Outside the area of the Station	2,661	33	0.9	
	TOTAL	20,000	226	1.13	

To be more accurate we mention these two tables :

The following table shows the percentage of filaria in the specimens taken by day in each village :—

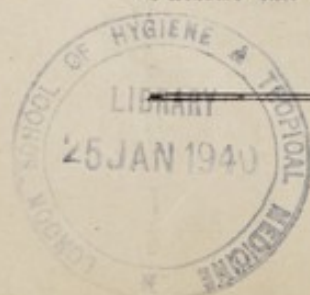
TABLE XVIII

Village	Specimens examined	Positives	Percentage
			%
Abu-Zaabal	1,440	4	0·3
El-Khanka	3,543	20	0·6
Kafr Ebian	229	4	1·8
Kafr Hamza	1,047	38	3·6
Sindiwa	2,443	9	0·4
Saryakous	1,561	22	1·4
El-Birka	500	1	0·2
El-Manayel	870	6	0·7
El-Minaya	213	3	1·4
El-Minayar	102	—	—
El-Alag	1,892	3	0·2
El-Khosous	465	—	—
El-Marg	1,291	—	—
Kafr el-Shorafa	545	—	—
Outside the area of the Station... ..	2,249	21	0·9
TOTAL	18,390	131	0·7

The following table shows the percentage of filaria in the specimens taken by night in each village :—

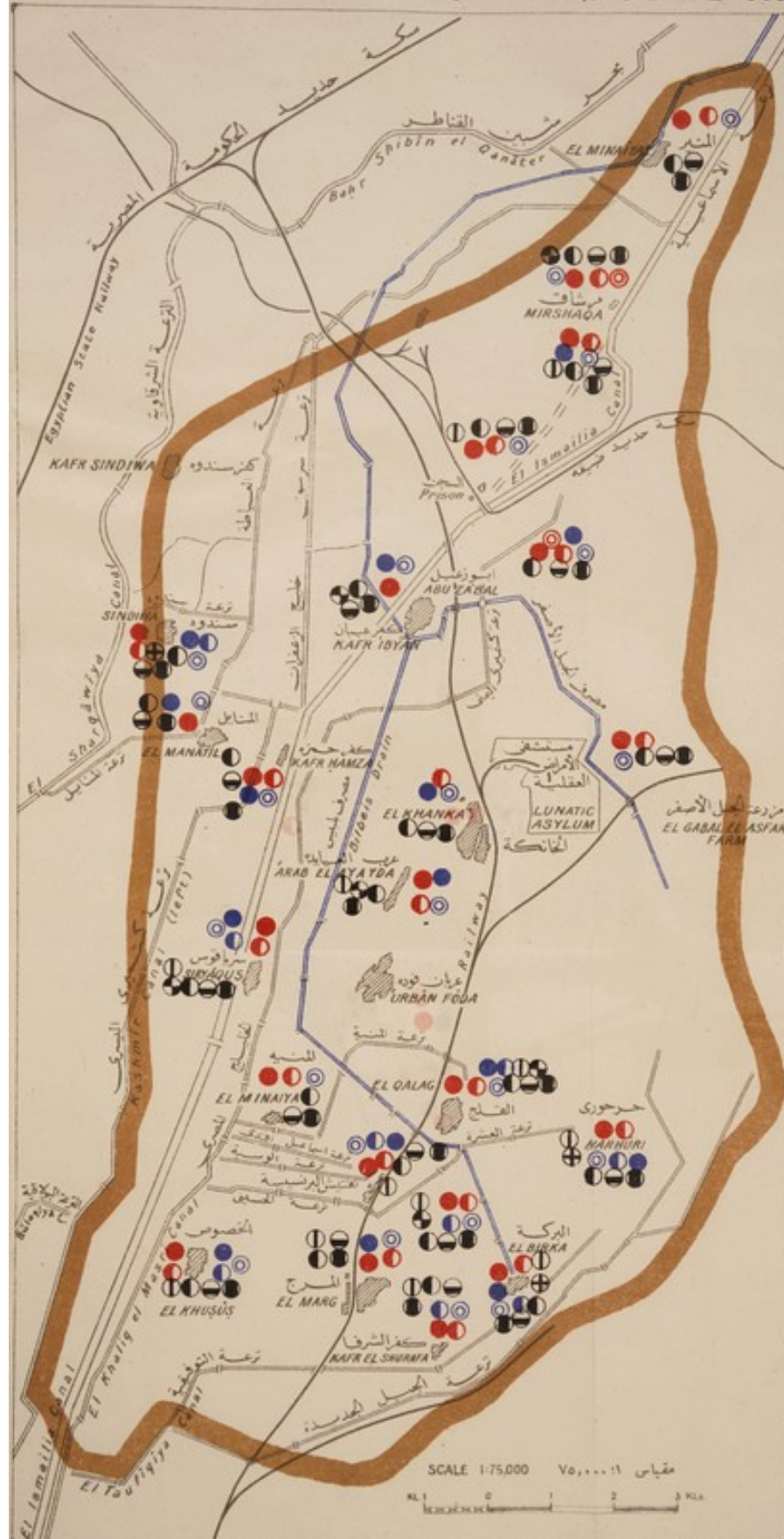
TABLE XIX

Village	Specimens examined	Positives	Percentage
			%
Abu-Zaabal	94	11	11·7
El-Khanka	296	6	2
Kafr Ebian	292	36	12·2
Kafr Hamza	176	11	6·2
Sindiwa	18	1	5·5
Saryakous	279	17	6
El-Birka	43	1	2·3
El-Manayel	—	—	—
El-Minaya	—	—	—
El-Minayar	—	—	—
El-Alag	—	—	—
El-Khosous	—	—	—
El-Marg	—	—	—
Kafr el-Shorafa	—	—	—
Outside the area of the Station	412	12	2·9
TOTAL	1,610	95	5·9



منطقة أبحاث الملاريا بالخانكة مبينة عليها أنواع يسرقات البعوض ١٩٣٥

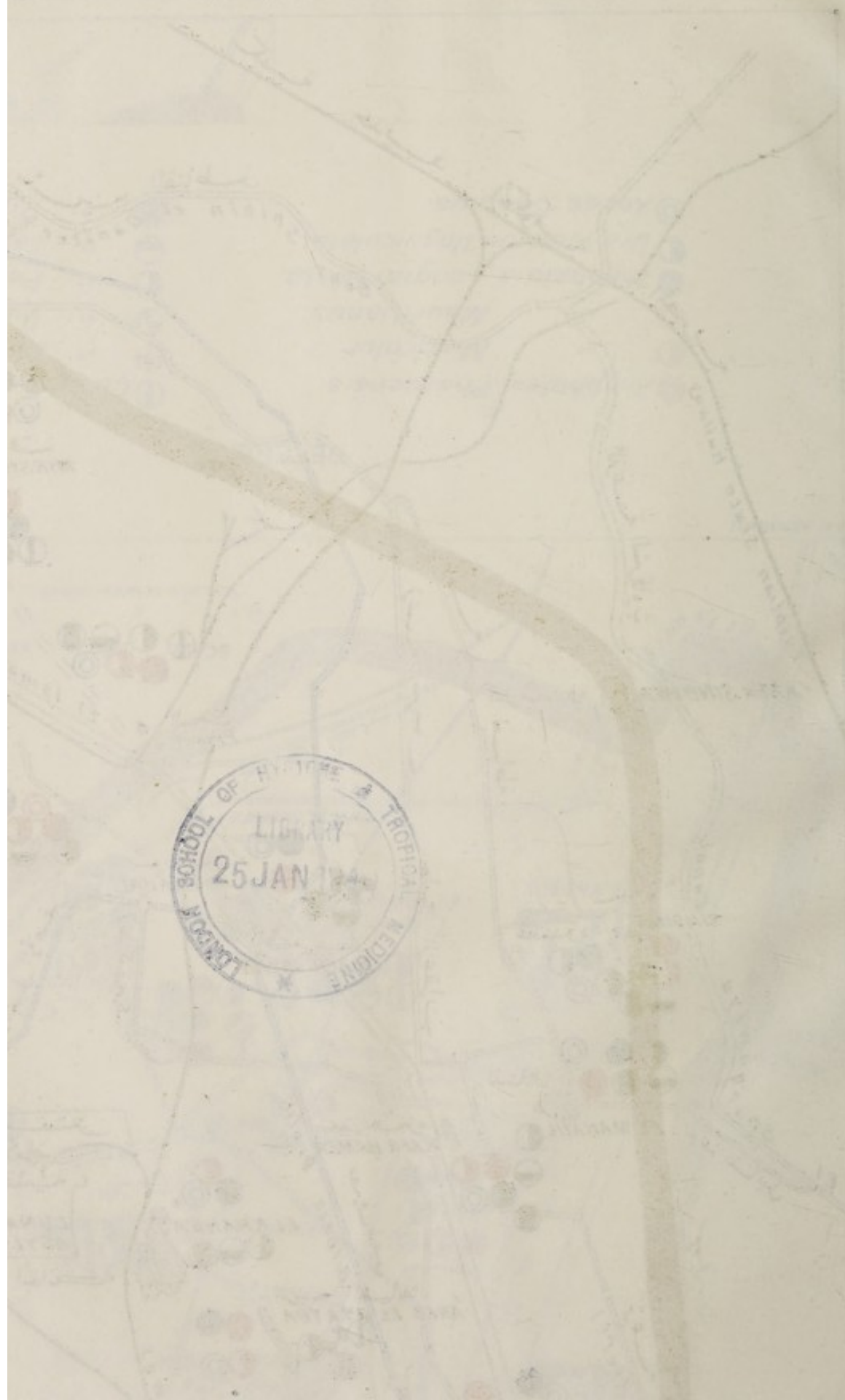
AREA SUPERVISED BY M.R. STATION SHOWING MOSQUITO LARVAE 1935



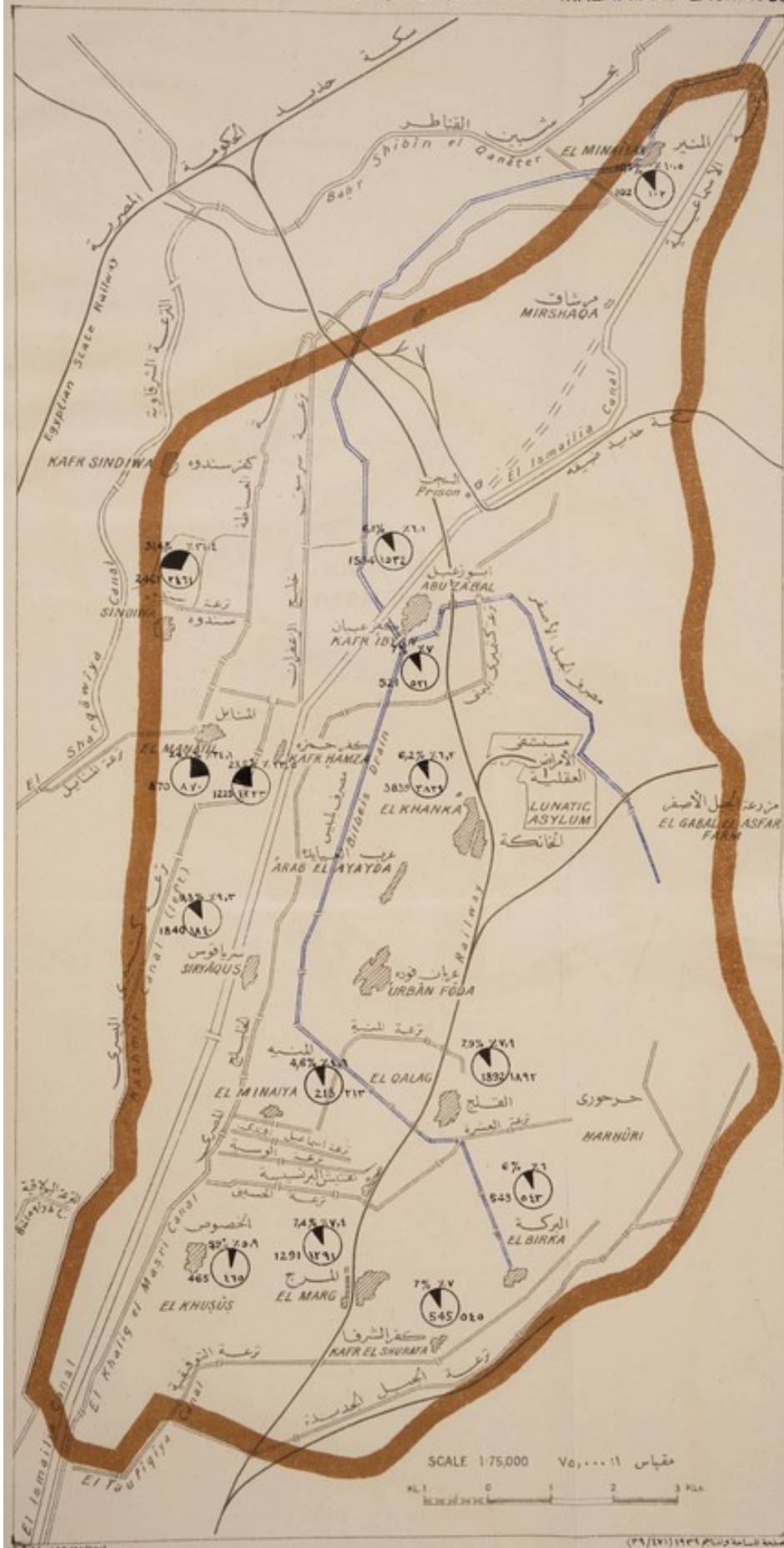
REFERENCE

- | | |
|------------------------------------|--------------------------|
| ● <i>Anopheles Pharoensis.</i> | ⊙ <i>Culex Pusillus.</i> |
| ⊙ " <i>Multicolor</i> | ⊕ " <i>Laticinctus.</i> |
| ⊙ " <i>Mauritanus.</i> | ⊕ " <i>Quasigelidus.</i> |
| ● <i>Theobaldia Longiareolata.</i> | ⊙ " <i>Perexiguus.</i> |
| ● <i>Uranotaenia Ungiculata.</i> | ⊙ " <i>Laurenti.</i> |
| ⊙ <i>Aedes Caspius.</i> | ⊙ " <i>Pipiens.</i> |

AREA SUPERVISED BY M.R. STATION SHOWING MC



منطقة أبحاث الملاريا بالخاصة مبنية عليها نسبة إصابات الملاريا ١٩٣٥
 VILLAGES INSIDE AREA OF THE STATION & PERCENTAGE OF MALARIA IN EACH, 1935



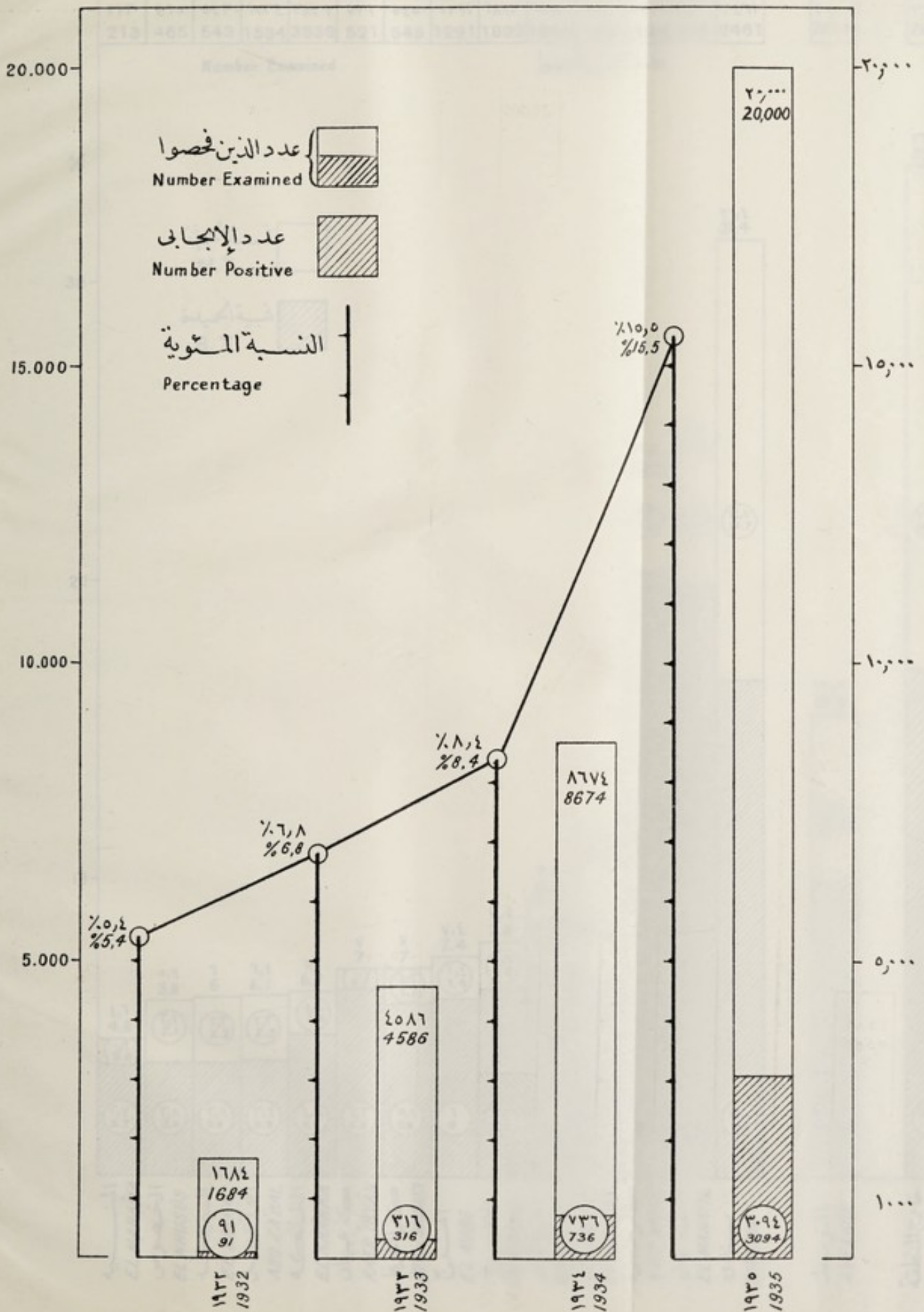
البلدات الواقعة في المنطقة المحيطة بالستasiun

VILLAGES INSIDE AREA OF THE STATION & PERCENTAGE OF

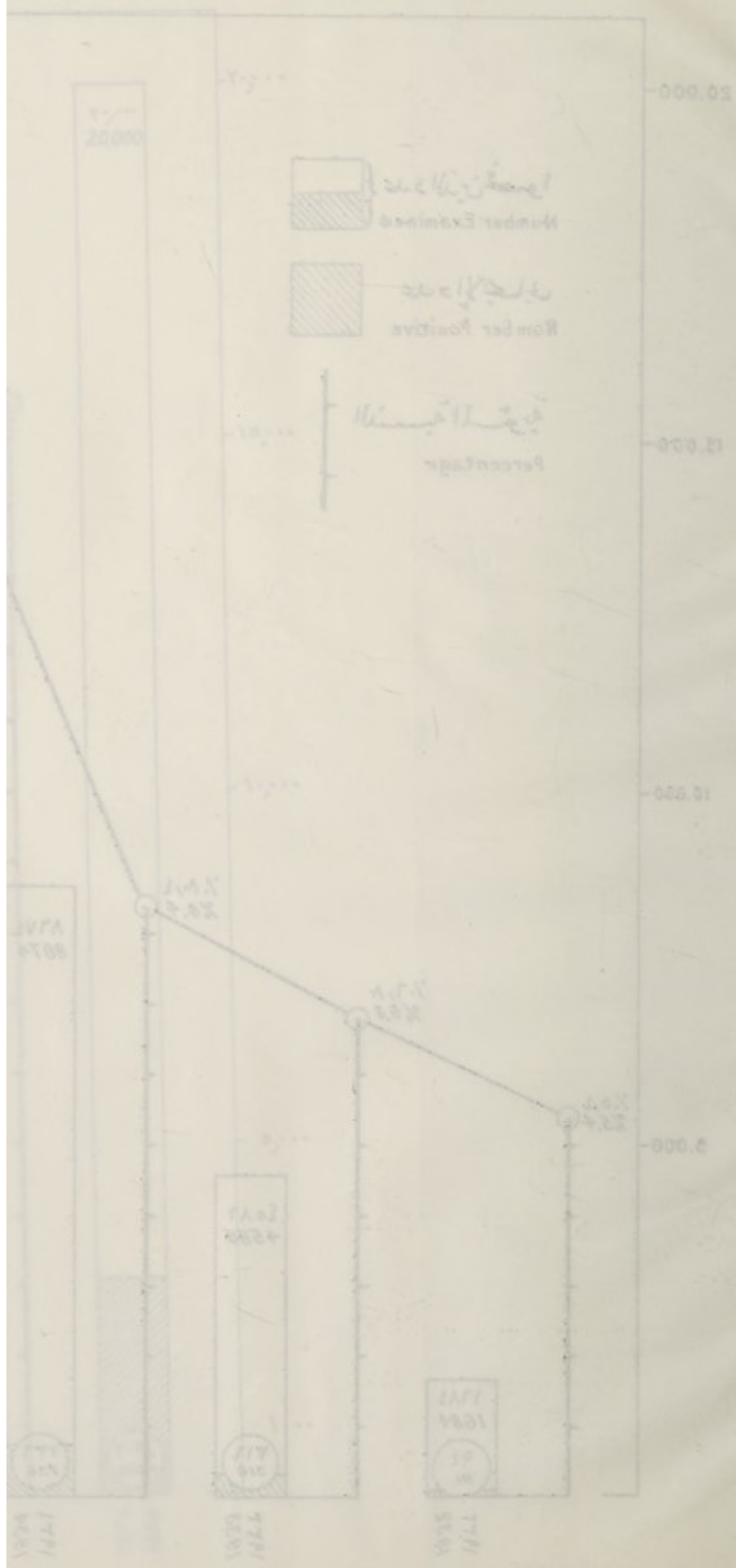


SCHOOL OF HYGIENE & TROPICAL MEDICINE
LIBRARY
25 JAN 1940
LONDON

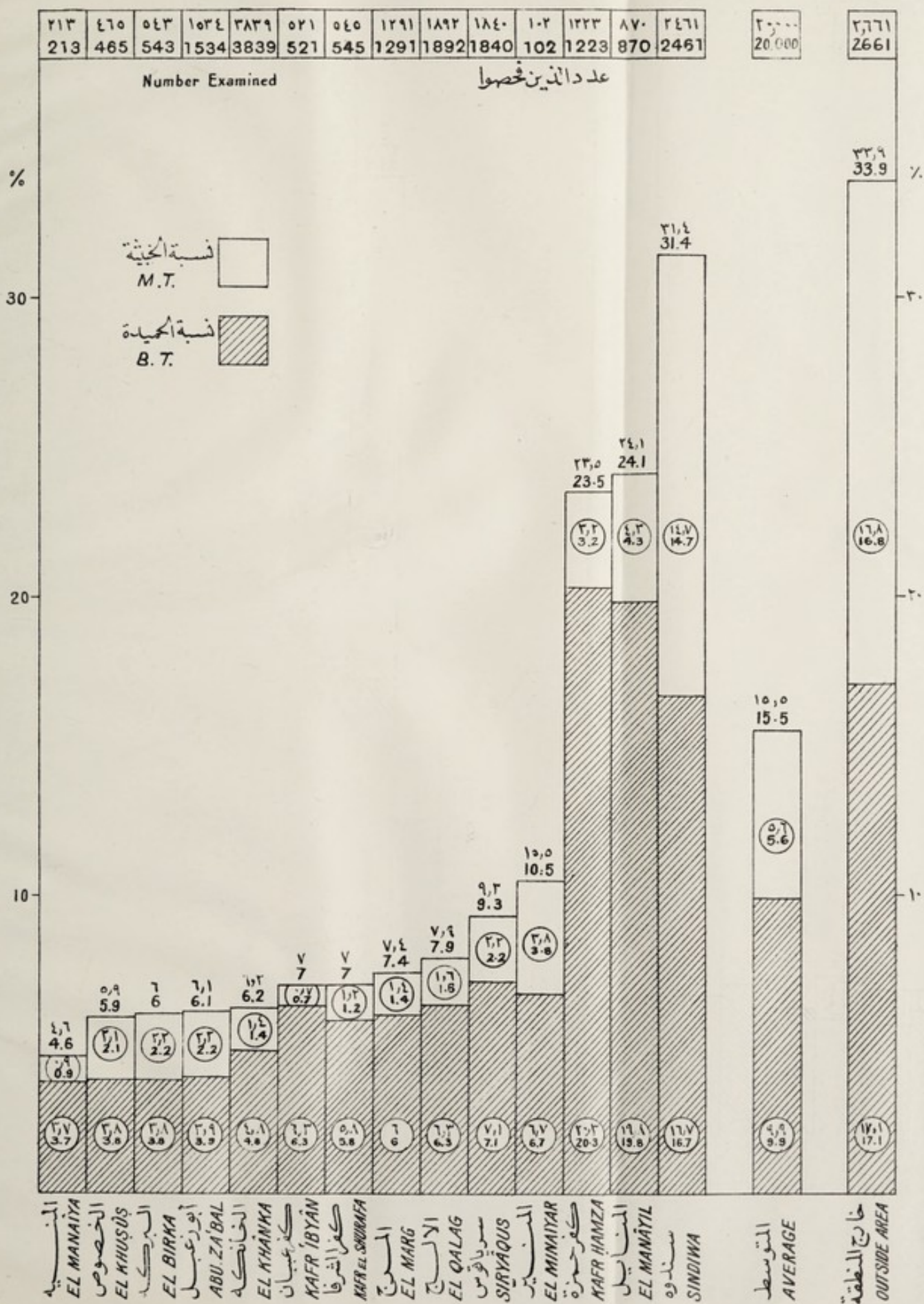
حالات الملاريا وعدد من فحصوا من سنة ١٩٣٢ الى سنة ١٩٣٥
 NUMBER EXAMINED & PERCENTAGE OF MALARIA FROM 1932-1935



NUMBER EXAMINED & PERCENTAGE ORMAL
۱۳۶۰ تا ۱۳۶۱ سال تحصیلی

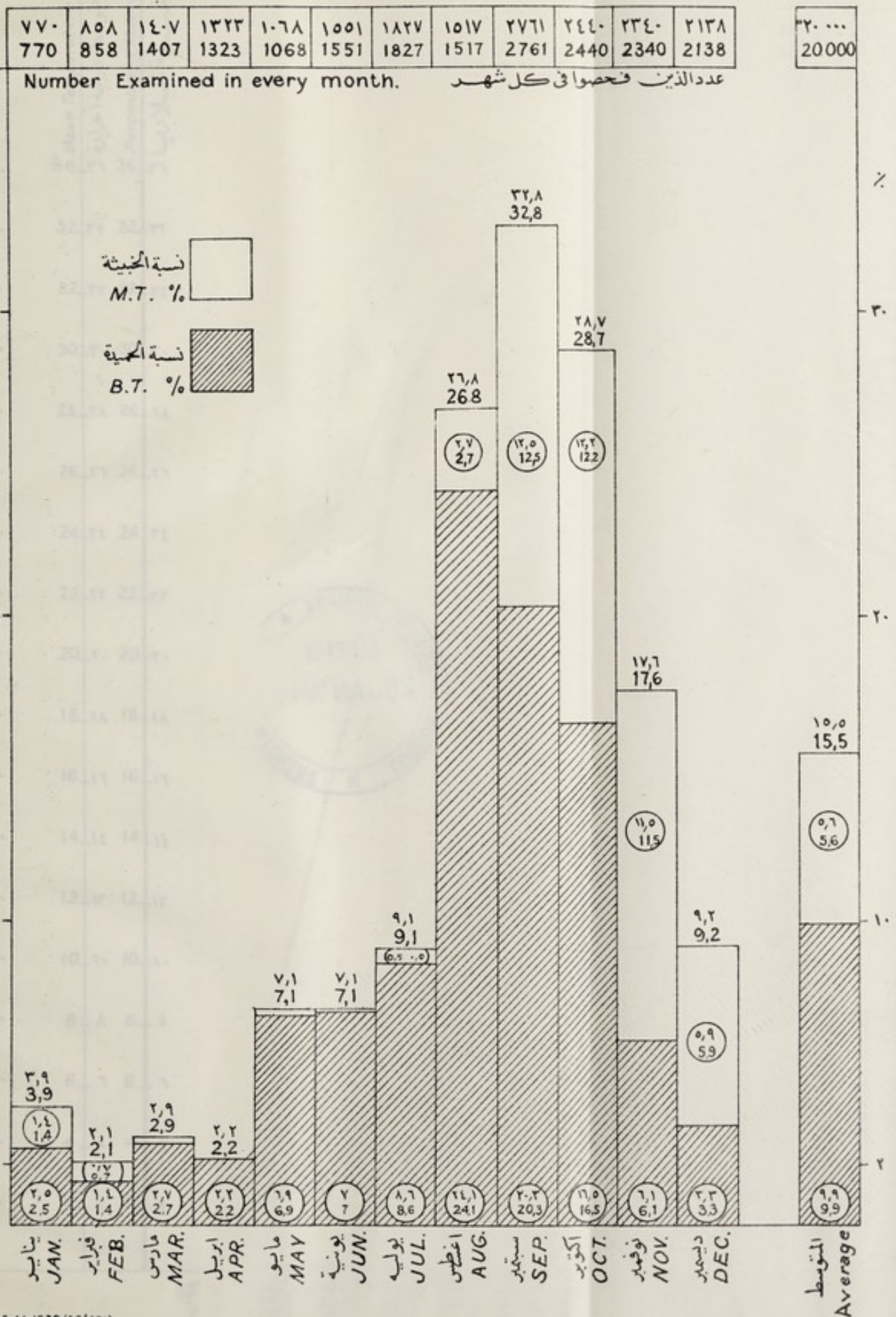


عدد الذين فحصوا ونسبة الايجابى للملاريا بنوعيهما في البلاد المختلفة سنة ١٩٣٥
 LOCALITY DISTRIBUTION OF MALARIA INCIDENCE FOR 1935



نسبة الملاريا بنوعيتها في الأشهر المختلفة لعام ١٩٣٥

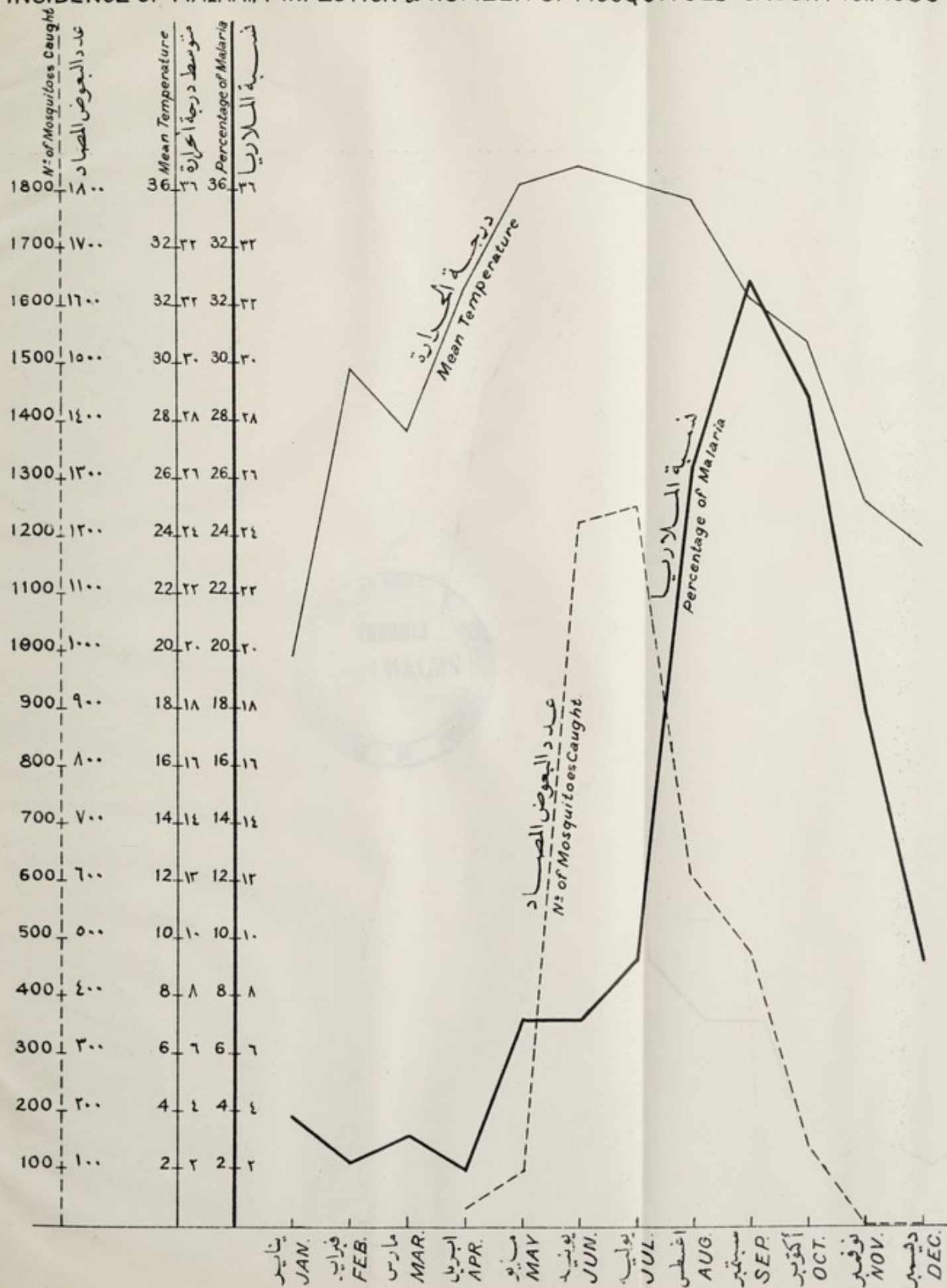
MONTHLY INCIDENCE OF MALARIA FOR 1935



1970
MONTHLY INCIDENCE OF MALARIA

Year	1970	1969	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955	1954	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922	1921	1920	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910	1909	1908	1907	1906	1905	1904	1903	1902	1901	1900	1899	1898	1897	1896	1895	1894	1893	1892	1891	1890	1889	1888	1887	1886	1885	1884	1883	1882	1881	1880	1879	1878	1877	1876	1875	1874	1873	1872	1871	1870	1869	1868	1867	1866	1865	1864	1863	1862	1861	1860	1859	1858	1857	1856	1855	1854	1853	1852	1851	1850	1849	1848	1847	1846	1845	1844	1843	1842	1841	1840	1839	1838	1837	1836	1835	1834	1833	1832	1831	1830	1829	1828	1827	1826	1825	1824	1823	1822	1821	1820	1819	1818	1817	1816	1815	1814	1813	1812	1811	1810	1809	1808	1807	1806	1805	1804	1803	1802	1801	1800	1799	1798	1797	1796	1795	1794	1793	1792	1791	1790	1789	1788	1787	1786	1785	1784	1783	1782	1781	1780	1779	1778	1777	1776	1775	1774	1773	1772	1771	1770	1769	1768	1767	1766	1765	1764	1763	1762	1761	1760	1759	1758	1757	1756	1755	1754	1753	1752	1751	1750	1749	1748	1747	1746	1745	1744	1743	1742	1741	1740	1739	1738	1737	1736	1735	1734	1733	1732	1731	1730	1729	1728	1727	1726	1725	1724	1723	1722	1721	1720	1719	1718	1717	1716	1715	1714	1713	1712	1711	1710	1709	1708	1707	1706	1705	1704	1703	1702	1701	1700	1699	1698	1697	1696	1695	1694	1693	1692	1691	1690	1689	1688	1687	1686	1685	1684	1683	1682	1681	1680	1679	1678	1677	1676	1675	1674	1673	1672	1671	1670	1669	1668	1667	1666	1665	1664	1663	1662	1661	1660	1659	1658	1657	1656	1655	1654	1653	1652	1651	1650	1649	1648	1647	1646	1645	1644	1643	1642	1641	1640	1639	1638	1637	1636	1635	1634	1633	1632	1631	1630	1629	1628	1627	1626	1625	1624	1623	1622	1621	1620	1619	1618	1617	1616	1615	1614	1613	1612	1611	1610	1609	1608	1607	1606	1605	1604	1603	1602	1601	1600	1599	1598	1597	1596	1595	1594	1593	1592	1591	1590	1589	1588	1587	1586	1585	1584	1583	1582	1581	1580	1579	1578	1577	1576	1575	1574	1573	1572	1571	1570	1569	1568	1567	1566	1565	1564	1563	1562	1561	1560	1559	1558	1557	1556	1555	1554	1553	1552	1551	1550	1549	1548	1547	1546	1545	1544	1543	1542	1541	1540	1539	1538	1537	1536	1535	1534	1533	1532	1531	1530	1529	1528	1527	1526	1525	1524	1523	1522	1521	1520	1519	1518	1517	1516	1515	1514	1513	1512	1511	1510	1509	1508	1507	1506	1505	1504	1503	1502	1501	1500	1499	1498	1497	1496	1495	1494	1493	1492	1491	1490	1489	1488	1487	1486	1485	1484	1483	1482	1481	1480	1479	1478	1477	1476	1475	1474	1473	1472	1471	1470	1469	1468	1467	1466	1465	1464	1463	1462	1461	1460	1459	1458	1457	1456	1455	1454	1453	1452	1451	1450	1449	1448	1447	1446	1445	1444	1443	1442	1441	1440	1439	1438	1437	1436	1435	1434	1433	1432	1431	1430	1429	1428	1427	1426	1425	1424	1423	1422	1421	1420	1419	1418	1417	1416	1415	1414	1413	1412	1411	1410	1409	1408	1407	1406	1405	1404	1403	1402	1401	1400	1399	1398	1397	1396	1395	1394	1393	1392	1391	1390	1389	1388	1387	1386	1385	1384	1383	1382	1381	1380	1379	1378	1377	1376	1375	1374	1373	1372	1371	1370	1369	1368	1367	1366	1365	1364	1363	1362	1361	1360	1359	1358	1357	1356	1355	1354	1353	1352	1351	1350	1349	1348	1347	1346	1345	1344	1343	1342	1341	1340	1339	1338	1337	1336	1335	1334	1333	1332	1331	1330	1329	1328	1327	1326	1325	1324	1323	1322	1321	1320	1319	1318	1317	1316	1315	1314	1313	1312	1311	1310	1309	1308	1307	1306	1305	1304	1303	1302	1301	1300	1299	1298	1297	1296	1295	1294	1293	1292	1291	1290	1289	1288	1287	1286	1285	1284	1283	1282	1281	1280	1279	1278	1277	1276	1275	1274	1273	1272	1271	1270	1269	1268	1267	1266	1265	1264	1263	1262	1261	1260	1259	1258	1257	1256	1255	1254	1253	1252	1251	1250	1249	1248	1247	1246	1245	1244	1243	1242	1241	1240	1239	1238	1237	1236	1235	1234	1233	1232	1231	1230	1229	1228	1227	1226	1225	1224	1223	1222	1221	1220	1219	1218	1217	1216	1215	1214	1213	1212	1211	1210	1209	1208	1207	1206	1205	1204	1203	1202	1201	1200	1199	1198	1197	1196	1195	1194	1193	1192	1191	1190	1189	1188	1187	1186	1185	1184	1183	1182	1181	1180	1179	1178	1177	1176	1175	1174	1173	1172	1171	1170	1169	1168	1167	1166	1165	1164	1163	1162	1161	1160	1159	1158	1157	1156	1155	1154	1153	1152	1151	1150	1149	1148	1147	1146	1145	1144	1143	1142	1141	1140	1139	1138	1137	1136	1135	1134	1133	1132	1131	1130	1129	1128	1127	1126	1125	1124	1123	1122	1121	1120	1119	1118	1117	1116	1115	1114	1113	1112	1111	1110	1109	1108	1107	1106	1105	1104	1103	1102	1101	1100	1099	1098	1097	1096	1095	1094	1093	1092	1091	1090	1089	1088	1087	1086	1085	1084	1083	1082	1081	1080	1079	1078	1077	1076	1075	1074	1073	1072	1071	1070	1069	1068	1067	1066	1065	1064	1063	1062	1061	1060	1059	1058	1057	1056	1055	1054	1053	1052	1051	1050	1049	1048	1047	1046	1045	1044	1043	1042	1041	1040	1039	1038	1037	1036	1035	1034	1033	1032	1031	1030	1029	1028	1027	1026	1025	1024	1023	1022	1021	1020	1019	1018	1017	1016	1015	1014	1013	1012	1011	1010	1009	1008	1007	1006	1005	1004	1003	1002	1001	1000	999	998	997	996	995	994	993	992	991	990	989	988	987	986	985	984	983	982	981	980	979	978	977	976	975	974	973	972	971	970	969	968	967	966	965	964	963	962	961	960	959	958	957	956	955	954	953	952	951	950	949	948	947	946	945	944	943	942	941	940	939	938	937	936	935	934	933	932	931	930	929	928	927	926	925	924	923	922	921	920	919	918	917	916	915	914	913	912	911	910	909	908	907	906	905	904	903	902	901	900	899	898	897	896	895	894	893	892	891	890	889	888	887	886	885	884	883	882	881	880	879	878	877	876	875	874	873	872	871	870	869	868	867	866	865	864	863	862	861	860	859	858	857	856	855	854	853	852	851	850	849	848	847	846	845	844	843	842	841	840	839	838	837	836	835	834	833	832	831	830	829	828	827	826	825	824	823	822	821	820	819	818	817	816	815	814	813	812	811	810	809	808	807	806	805	804	803	802	801	800	799	798	797	796	795	794	793	792	791	790	789	788	787	786	785	784	783	782	781	780	779	778	777	776	775	774	773	772	771	770	769	768	767	766	765	764	763	762	761	760	759	758	757	756	755	754	753	752	751	750	749	748	747	746	745	744	743	742	741	740	739	738	737	736	735	734	733	732	731	730	729	728	727	726	725	724	723	722	721	720	719	718	717	716	715	714	713	712	711	710	709	708	707	706	705	704	703	702	701	700	699	698	697	696	695	694	693	692	691	690	689	688	687	686	685	684	683	682	681	680	679	678	677	676	675	674	673	672	671	670	669	668	667	666	665	664	663	662	661	660	659	658	657	656	655	654	653	652	651	650	649	648	647	646	645	644	643	642	641	640	639	638	637	636	635	634	633	632	631	630	629	628	627	626	625	624	623	622	621	620	619	618	617	616	615	614	613	612	611	610	609	608	607	606	605	604	603	602	601	600	599	598	597	596	595	594	593	592	591	590	589	588	587	586	585	584	583	582	581	580	579	578	577	576	575	574	573	572	571	570	569	568	567	566	565	564	563	562	561
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رسمي بين العلاقة بين درجة الحرارة ونسبة الملاريا وعدد البعوض المصاد في الأشهر المختلفة لعام ١٩٣٥
 DIAGRAM TO SHOW THE RELATION BETWEEN THE MEAN TEMPERATURE & THE
 INCIDENCE OF MALARIA INFECTION & NUMBER OF MOSQUITOES CAUGHT FOR 1935



1970-71
 DIAGRAM TO SHOW THE RELATION BETWEEN THE MEAN
 INCIDENCE OF MALARIA INFECTION & NUMBER OF MOSQUITOES

