Four reports on yellow fever in Nigeria during 1913 / by E.J. Wyler.

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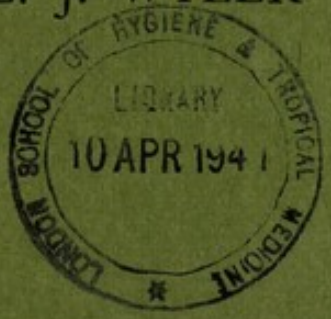

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(WEST AFRICA)

REPORTS

ON QUESTIONS CONNECTED WITH THE

INVESTIGATION OF NON-MALARIAL FEVERS IN WEST AFRICA

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FOUR REPORTS ON YELLOW FEVER IN NIGERIA DURING 1913

BY

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REPORT NO. 1

An investigation carried out in connection with the case of a European, who died in Lagos Hospital on May 14th, having come from Abeokuta on May 10th, 1913.

I. *General description of Abeokuta District and Town*

(*a*) Abeokuta District. Boundaries:

On the north by Ibadan District.

On the south by Lagos and Ikorodu Districts.

On the west by Ibadan, Meko and Badagri Districts.

On the east by Ibadan and Ikorodu Districts.

The most westerly part of Abeokuta District is distant from the Dahomey boundary approximately 15 miles, and the average distance of the western boundary of Abeokuta District from the Dahomey boundary is roughly 30 to 40 miles.

Area: 1,869 square miles.

Total population: 264,814, comprised of:

Natives of West Africa	264,723	Census 1911.
Europeans	80	
Other non-West Africans	11	

Average density of native population per square mile: 141·63.

(*b*) Abeokuta Town:

Area of inhabited portion: 3,420 acres.

Total population: 51,255.

Distance from Lagos: 64 miles.

Mean annual rainfall: 39·4 inches.

(Survey of town by E. P. Cotton, Director of Surveys, 1909.)

Situation and general description.—The town is situated on a hilly area of granite formation on the left bank of the Ogun River.

The elevation above sea-level varies in different parts by 300 feet, the surface of the river being 100 feet, and the highest point of the town 400 feet, above sea-level. The native houses are for the most part one-storeyed; their walls, with few exceptions, being built of mud, and the roofs (for the greater part without gutters) are of corrugated iron.

With the exception of about nine miles of motor-road intersecting the town in various directions there are practically no streets, houses with their compounds (enclosures) being built in a haphazard way, and separated from one another, here by footpaths of varying width, there by more or less extensive areas of 'bush' and patches of rank grass, which are allowed to grow unchecked for the most part, and serve both as public latrines and dumping grounds for tins, bottles, and garbage of all kinds.

There is no European reservation; the only part of the town which could pretend to this distinction is that in which the District and Assistant District Commissioners' and Prison Superintendent's houses are situated (on adjacent hills). In their immediate vicinity (with the exception of the dwellings of their personal attendants) there are no native houses, but a prison of considerable size, with houses for prison attendants and one or two dwellings for other native officials are situated between the two hills.

In one quarter of the town (Ibarra District) there are a number of European traders' houses, some of which are just outside the town limit. These stand among uncleared 'bush' and grass. The others, just within the town limit, are situated close to native houses, the distance varying from 20 to 58 yards, some being also in juxtaposition to more or less wide areas of uncleared bush. Mosquito-proofing of houses or rooms is practically non-existent. One or two non-officials have made ineffectual attempts in this direction.

Water-tanks are inadequately protected. I have examined a large number of them, and find that the majority abound in mosquito larvae.

II. *Rainfall*

The rains in Abeokuta were this year (and also last year) 'later' than usual. In Appendix 4 will be found, for purposes of

comparison, a table showing the rainfall (and also the average maximum shade temperature) for the months of March, April, and May, 1911, 1912, and 1913.

III. *Medical Administration*

There are two Native Medical Officers at Abeokuta. They are employed by the Abeokuta (Egba) Government. The Medical Officer (European) at Aro (about two miles from Abeokuta, on the opposite side of the river) attends to Europeans.

IV. *The patient's health prior to his illness*

I find that:

(i) He had suffered from what his friends describe as 'gastric attacks,' 'stomach trouble,' and 'chronic biliousness' for more than three years.

(ii) He suffered from boils in the left axilla and one or two on the body, which he said were very painful, about one week before going to Lagos.

(iii) For a year preceding his death he was apparently very 'run down,' and his cachectic appearance was a subject of general comment.

His occupation was arduous to him, and he complained a good deal about the excessive exertion it entailed.

He had three 'stores' (shops) to manage, and he was the only representative of his firm in Abeokuta.

One of these shops formed part of his residence, and it was necessary for him to visit the other two, which are in opposite directions at a distance of two or three miles, once a day. The journey, over a hilly road, was usually accomplished by bicycle, his motor-cycle, after the manner of some of its kind, being mostly *hors de combat*. The shops were closed daily about 3.30 p.m. He is said always to have used a mosquito-net at night.

V. *Actual movements of the patient for three months before his illness*

On consulting his diary, to which I have had access by the courtesy of his successor, it appears that he went to Lagos on Sunday, 9th February, purely on business in response to a telegram

received on the previous day from the business manager of his firm at Lagos. He stayed at Wilberforce House (where he also stayed immediately before his admission to hospital in May). He slept in a camp bed under a mosquito-net.

The manager, whom I interviewed upon my return from Abeokuta, informed me that there had been no exceptional number of cases of illness among his native employees at the time of this visit, and there are no records in Lagos Hospital of suspicious cases among his European employees.

Apart from this journey I find no evidence of the patient having been away from Abeokuta, or of his having slept elsewhere than in his house for at least three months prior to death. I have questioned his friends and also his 'boys' (servants), whom by the co-operation of his friends I succeeded in tracing. The 'boys' were, of course, well acquainted with his movements and would certainly have remembered even a short absence. There is no reason to doubt that their evidence was truthful. The patient was, however, occasionally out after nightfall, though seldom during the last month; so that, assuming that he acquired his infection in Abeokuta, he need not necessarily have done so in his own house.

I have examined the two houses which he visited in the evening during the fortnight preceding his departure for Lagos, and found *Stegomyia fasciata* larvae in both, but have been unable to obtain any history of illness in the occupants or in those living in the vicinity.

VI. *Prevalence at Abeokuta or other places visited by patient of any suspicious cases of fever*

In addition to the two Native Medical Officers who have charge of the Native Hospital, and one of whom is also Sanitary Medical Officer, there is a French Catholic Mission, the Father Superior of which, though not a qualified medical man, is an enthusiastic and successful practitioner both in surgery and medicine, and gave me every possible assistance in my enquiry.

I was informed, both by the native officers and the Father Superior, that no suspicious cases of fever had been detected. Unfortunately, however, no details of cases are recorded. Immediately after my arrival, I took occasion to explain the object

of my visit to the Reverend Father and to the native officers, and asked for their co-operation. I requested them particularly to be on the alert for mild cases of yellow fever in both adults and children, and explained verbally and in writing the points to which attention might with advantage be directed. They were also asked to be so good as to communicate with me at once on the occurrence of any suspicious case, and some weeks later the Father Superior wrote to me reporting an undoubted case of the disease in a Syrian, which has since been specially investigated.

In Appendix 1 is recorded a case of some interest that applied for treatment at the Catholic Mission while I was still in Abeokuta. No cases have been referred to me from the practice of the Native Medical Officers which could have any connection with this report.

As inquest cases in Abeokuta are referred by the District Commissioner exclusively to the Medical Officer, Aro, for *post-mortem* examination, I have examined his *post-mortem* records for 1913. There occurs amongst them one case which appears highly suspicious. In Appendix 2 will be found a copy of the *post-mortem* notes by the then Medical Officer, Aro, together with a history of the case as elicited by me from a relative of the deceased, and a commentary.

VII. *Any recent (suspicious) high mortality amongst natives at Abeokuta or other places visited by patient, especially native children*

Abeokuta.—There is no registration of births or deaths here. There does not appear to have been any recent high mortality among either adults or children. In addition to inquiries at the missions and from the Native Medical Officers, I have tried to gain information by personally visiting numerous compounds in various parts of the town, my attention being specially directed to those in the area of the cases recorded in Appendices 1 and 2, and to those around the deceased's house. The natives are, however, very reticent and suspicious. At first I was accompanied by a police officer, but fearing that this might arouse distrust, I continued my search accompanied only by a native boy. In order further to gain the confidence of the natives, I treated several cases of illness on

which I happened to light. Nevertheless, my researches under this head are with purely negative result.

Lagos.—Here, also, there does not appear to have been any suspicious high mortality during the three months preceding the patient's death (February, March and April). I attach (Appendix 5) for purposes of comparison a table showing total deaths of adults and children, and death-rates per thousand of population, respectively, for the first six months of the years 1910, 1911, 1912 and 1913. It will be seen from this that in May, 1913, there is an appreciable increase in infantile mortality.

I would add that all deaths in Lagos are registered, but that medical certification of death is not compulsory, e.g., 356 deaths were certified in a total of 2,175 deaths registered (= 16·3 per cent.).

VIII. *Number of Europeans in Abeokuta or other places visited by patient, and suspicious cases of fever amongst them within the last twelve months*

Abeokuta.—The number of Europeans resident in Abeokuta at the date of the onset of the patient's illness was 32. There was also one Syrian, who (three months later) was attacked by yellow fever. There were no suspicious cases of illness recorded during the preceding twelve months. Out of the 32 residents, I found that six had lived in regions where yellow fever is endemic (West Indies and South America) before coming to West Africa. In view of a perhaps previously acquired immunity, I have collected the figures which, for the sake of clearness, are appended in tabular form (Table 1). It will be seen, however, that, except in one case, the interval of residence in a non-endemic area after leaving the endemic area was perhaps long enough to have destroyed immunity acquired by residence in contradistinction to immunity acquired by having passed through an attack of the disease. None of these persons have ever had yellow fever so far as they are aware. From the same point of view a table (Table 2) is appended of the remaining 26 residents. In this connection it should be remarked that the deceased, though he had been in West Africa before, had, previously to his last tour, been in Europe for fifteen months, and was possibly for this reason non-immune.

Lagos.—The number of Europeans, excluding Syrians, resident in Lagos is approximately 350 (officials, approximately 105; others, approximately 245). The number of Syrians is about 60. I have examined the hospital records from the commencement of the year 1912 up to the time of the patient's death, in May, 1913, and find that during this period there have been no cases recorded as suspicious. However, bearing in mind the fact that typical and mild cases of the disease may have escaped recognition, and may be mistaken for malaria (Guiteras), I have analysed the cases of malaria occurring during this period.

Out of 127 cases of malaria, 21 had albuminuria. Out of these 21, in 10 the albuminuria cannot be satisfactorily accounted for by the temperature or other causes; in 9 out of the 10 it did not reach 103°. (The case in which it exceeds 103° is No. 7.) I append (Table 3) a list of these 10 cases, showing their salient features. All of them recovered. In two only is there a record of blood examination. There are no notes in regard to any possible pre-existing albuminuria. Four are officials, six are non-officials.

In Case 7 only is there a record of pulse-rate subsequently to admission, and I have cited it separately (it also appears in Table 3 to avoid confusion), as it appears to present some specially significant features.

It will be seen (i) that of the ten cases, six are seamen, notoriously careless livers ashore; (ii) that the specific gravity of the urine quoted in all but one instance is such as to discount the probability of the existence of renal disease.

It seems to me that in all these the presence of an albuminuria is difficult to explain, otherwise than on the supposition that they were really mild yellow fever. It is, of course, possible that the albuminuria, at any rate in a certain proportion of the cases, may have been due to a high pyrexia before admission to hospital. This possibility may, however, be excluded in the case of the four officials, who would call for medical attention immediately on being taken ill.

As a matter of interest it may be remarked that two of the cases came to Lagos from Abeokuta on the day of their admission to hospital.

Case No. 7.—Seaman. (?) Age. Admitted to hospital December, 1912. First trip to the West Coast of Africa. Has been out one month. Does not take quinine.

There are no notes of the onset of the illness.

On admission.—Headache complained of. Urine: thick cloud of albumen. Temperature, 103·6°. Pulse, 104.

Second day.—Maximum temperature, 104°.

Pulse, not recorded.

Headache continues.

Urine, 19 ounces.

Third day.—Maximum temperature, 102·9°.

Pulse, 88.

Urine, 17 ounces. Albumen in large amount.

Face flushed, eyes red, conjunctivae yellowish. Has vomited once after quinine; no blood in the vomit.

Patient says he feels worse, but is apparently better.

Fourth day.—Maximum temperature, 101·6°.

Pulse, 72.

Fifth day.—Maximum temperature, 100·4°.

Pulse, not recorded.

Albumen gone.

No jaundice.

6th, 7th, 8th, 9th day.—Uneventful recovery.

Blood, no parasites found.

The patient received five grains quinine three times a day throughout the illness. There are no notes of the state of the tongue.

In addition to these cases which were treated in Lagos Hospital, there is a record of an autopsy on a man who died on board a steamship in Lagos Roads on 2nd December, 1912. As it appears to present some doubtful features, I quote the record in detail:

Male.

Age, 34.

Death occurred at 5 p.m. on board s.s. "Shonga" in Lagos Roads, December 2nd, 1912.

Post-mortem held at 1 p.m., December 3rd, 1912, in hospital mortuary 20 hours after death.

External appearances.—Body well nourished. Rigor mortis passing off. Putrefaction had commenced. Bullae on skin. Post-mortem lividity in dependent parts.

Abdomen.—Liver somewhat enlarged, soft, and congested. Stomach, thinning of walls at greater curvature. Mucosa congested. Stomach contents, dark-coloured fluid.

Spleen, enlarged and soft; almost diffluent. (Temperature of body at time of death was 110° F.)

Sections of spleen and liver taken and sent to Medical Research Institute for examination.*

Death certified as due to hyperpyrexia. "No doubt due to malarial fever."

J. D. Finlay,
Medical Officer.

* There is no record to be found—E. J. W.

The 'Shonga' did not carry a doctor.

There were no passengers.

The ship had called at numerous British West African ports, from none of which, however, had yellow fever been reported. She had also called at a Liberian port to embark a native crew. No cases of the disease had been reported from Liberia.

In order to complete this series of cases I cite the following. I would add that it was decided not to be a case of yellow fever after very careful deliberation. The ship, on which the patient was engineer, had come to Lagos from Hamburg on 19th January. The patient sailed with her.

The only intermediate port of call was in Liberia, to embark a native crew. Since her arrival the ship had plied solely between Lagos and Forcados and ships lying in Lagos Roads. There had been no sickness on board prior to the patient's illness, and subsequently also there was none, except in the case of one man who was admitted to Lagos Hospital, suffering from a typical attack of malarial fever, on 21st May, and discharged on the 2nd June, 1913. The patient was, of course, frequently ashore both at Lagos and Forcados.

In my report, No. 4, which will deal with the outbreak of the disease which occurred in the Central Province recently, I hope to enter more fully into the relation of ships to epidemics of yellow fever in Southern Nigeria, which appears to be suggested by some of the foregoing cases.

Sex: Male.
Age: 28 years.
Nationality: German.
Occupation: Engineer on s.s. "Gouverneur von Puttkammer."
Date of admission to hospital: 8th May, 1913.
Date of death: 9th May, 1913.
Diagnosis: Uraemia and malaria.

History: Patient had been ill three days with fever. Vomited after taking any drink. Bowels had been confined, but were opened by an aperient. No headache.

On admission.—Tongue coated. Bowels opened. Liver and spleen normal. No tenderness in epigastrium. Pulse 112. Heart sounds normal. Respirations 24. Temperature 103·4° F. Severe headache. Pupils widely dilated. Face puffy. Slight oedema over both legs. Urine, acid; s.g. 1030. Albumen, large quantity. Blood, young ring parasites; aestivo-autumnal. Mononuclear leucocytosis.

Course.—12 p.m. on day of admission. Temperature 104°. Vomited once. Urine contains albumen. Urine passed at 8 45 p.m.—4 ozs. *9th May*, 1913.—

Patient very restless and delirious. No sleep. No urine passed. Bowels opened. Watery motions. Vomiting very frequent—dark, acid-smelling liquid. Saline given intracellularly 250 c.c. 1.30 p.m.—Pilocarpine, grs. ¼. Pupils widely dilated. Delirium present. 2 p.m.—Uraemic convulsions began. Vomiting very troublesome—dark, acid-smelling liquid. 3.20 p.m.—Died.

Pulse and temperature were as follows :—

	8th May				9th May	
	12 noon	4 p.m.	8 p.m.	12 midnight	4 a.m.	8 a.m.
Temperature	104	104·8	103·8	104	102·8	102·8
Pulse	112	100	—	88	98	104

Treatment (specific).—Two intramuscular injections of quinine on the day of admission—·4 grms.

9th May.—Inj. pilocarpine, grs. ¼. Chloral hydrat. grs. 20, per rectum.

Note.—The patient is said on good authority to have been a chronic alcoholic subject.

Post-mortem Notes

Rigor mortis had not set in.

Body was extremely fat and well nourished.

There was no yellow staining of the skin or conjunctivae.

Thorax—Heart : Pericardium normal, contained some fluid. Heart flabby and large deposit of fat round it. Otherwise normal. Lungs : No pleural adhesions. No effusion. Congested, particularly at bases.

Abdomen—Liver : Pale in colour. On section was fatty, the cut surface being greasy. Stomach : Pale in colour. No external haemorrhages. Contained a small quantity of brown fluid with a urinous odour. The mucous membrane was not congested. No haemorrhages. Intestines : Normal in appearance. No external haemorrhages. There was no congestion of the mucous membrane ; a brown faecal fluid was present in small amount. Kidneys : Both kidneys were enlarged and congested, the capsule stripped easily ; no external haemorrhages were to be seen. On section the cortex appeared swollen and pale. The omentum was extremely fatty, and there was a large deposit of fat about the abdomen.

Extract from Report upon Pathological Specimens sent for Examination to Medical Research Institute, Yaba

The organs were, unfortunately, somewhat damaged by being forced into a jar with insufficient preserving fluid. In consequence, it is difficult to determine to what extent the appearance of sections is due to this cause, and to what extent to pathological changes.

The kidney was enlarged, its capsule adherent, and its surface showed injected stellate veins. The cortex was swollen and yellowish ; the pyramids not markedly congested. The tubules distended, the epithelium granular ; the tubules contained casts. Glomeruli, large. Capsule, thickened. Interstitial tissue somewhat increased.

The liver (small piece) was yellow in section ; surface, smooth. Extensive and intense fatty degeneration.

The spleen was enlarged and pulpy. The capsule thickened, congested, and dotted with masses of yellowish pigment. (The spleen, however, was certainly insufficiently preserved as it had putrified.)

The stomach.—Several minute haemorrhages. Mucosa, catarrhal.

The appearances were hardly those one would expect to meet with in a case of acute nephritis, and, on the whole, were more suggestive of an acute fever. I suppose there was no suspicion of yellow fever ?

J. W. Scott Macfie

Table No. 1

Number	Number of years residence in an endemic area other than West Africa	Period between residence in an endemic area and first coming to West Africa (Interval of residence in a non-endemic area)	Number of months in West Africa since last in Europe	Number of months in Abeokuta since last in Europe	Number of months in other parts of West Africa since last in Europe	Number of months in West Africa (not including leave) since first coming to West Africa
1. Government official ...	4	10 weeks	8½	8½	—	8½
2. ,, ,, ...	2	12 years	5	4	1	43
3. ,, ,, ...	12	11 ,,	11	11	—	95
4. Non-official	20	2 ,,	11	11	—	71
5. ,, ...	4	3 ,,	12	2	10	12
6. ,, ...	1	20 ,,	70	70	—	272

Table No. 2

Number	Number of months in West Africa since last in Europe	Number of months actually resident in Abeokuta since last in Europe	Number of months in other parts of West Africa since last in Europe	Total number of months resident in West Africa since first coming to West Africa (not including leave)
1. Government official... ...	8	8	—	20
2. ,, ,, ...	3½	3½	—	74
3. ,, ,, ...	6	6	—	29
4. ,, ,, ...	13	7	6	13
5. ,, ,, ...	2	2	—	15
6. ,, ,, ...	12	12	—	12
7. Non-official	7	7	—	103
8. ,, ...	4½	4½	—	42
9. ,, ...	4	4	—	44
10. ,, ...	7	7	—	26
11. ,, ...	5	3	2	62
12. ,, ...	5	4	1	5
13. ,, ...	14	6	8	63
14. ,, ...	29	14	15	29
15. ,, ...	26	15	11	26
16. ,, ...	20	20	—	156
17. ,, ...	13	3	10	13
18. ,, ...	2	2	—	213
19. ,, ...	2	2	—	156
20. ,, ...	4	4	—	89
21. ,, ...	19	16	3	111
22. ,, ...	40	40	—	166
23. ,, ...	5	5	—	228
24. ,, ...	6	5	1	80
25. ,, ...	18	1	17	57
26. ,, ...	9	8	1	9

Table No. 3

Number	Date	Age	Occupation	Temperature on admission to hospital	Pulse on admission to hospital	Highest Temperature attained	Number of days in hospital	Specific gravity of Urine	Parasites in Blood	Remarks
1 Official	January, 1912	34	Telegraph Department	99·4	92	100·0	5	1030	No record	History of low fever several days before admission. Condition of tongue not noted
2 Non-official	February, 1912	25	Trader (from Abeokuta)	98·8	50	99·5	13	1030	No record	Pronounced tenderness in epigastrium. Liver and spleen palpable. Condition of tongue not noted
3* Non-official	February, 1912	28	Seaman	101·4	90	104·0 (On second day.)	5	1020	No record	Condition of tongue not noted
4 Official	July, 1912	24	Engineer (from Abeokuta)	101·8	72	101·8	13	1015	No parasites found	Spleen palpable. Widal negative. Temperature not reduced by quinine. Tongue furred on admission
5* Non-official	November, 1912	40	Seaman	100·6	84	101·6	5	1025	No record	Condition of tongue not noted
6* Official	December, 1912	34	Seaman	102·4	120	102·4	5	No record	No record	Condition of tongue not noted
7* Non-official	December, 1912	?	Seaman	103·6	104	104·0	9	1025	No parasites found	Notes of case on p. 8
8 Non-official	December, 1912	24	Trader	102·4	104	102·9	5	1030	No record	Said on admission that he had been vomiting for ten days. Condition of tongue not noted. Spleen four inches below costal margin
9 Official	March, 1913	33	Seaman	100·8	88	102·9	6	1025	No record	Tongue coated on admission
10* Non-official	March, 1913	41	Seaman	99·6	92	99·6	2	1019	No record	Tongue coated on admission

* For further notes on these cases see Report No. 4, Section III, pages 158, 159, 160, 161, 163.

IX. *Conditions as regards* Stegomyia *in Abeokuta and other places visited by patient, especially near residence of, and places frequented by, patient*

The conditions throughout Abeokuta are very favourable to breeding of *Stegomyia*. Water is obtained from wells by the natives (only those living in that part of the town which is nearest the river use river water), and is carried and stored in uncovered earthenware pots varying in capacity from one to eight gallons. (The manufacture of these pots is an important local industry.) Practically every compound contains large numbers of these vessels; in one selected at random in which ten persons lived there were thirty-three.

Some of these pots are sunk in the ground (often nearly to the brim) and are therefore never completely emptied. Moreover all wells (except three) are privately owned, and a charge, varying with season, is made for water. Hence it is to the financial interest of the native to economise water and to empty his water pot as slowly as possible. In one compound, for example, there were twelve pots, eleven of which contained larvae. In three compounds chosen at random there were fifty-two pots; thirty-five of these contained larvae, largely *Stegomyia*, nine were dry, and eight contained water without larvae. These compounds were within 200 yards of the patient's house.

I have examined forty compounds in widely separated parts of the town and have found larvae in all of them without exception. *Stegomyia fasciata* are present in considerable numbers, and form a large proportion of all larvae. This I have ascertained by actual hatching out. I have examined a number of water-tanks (filled by rain from the roof) attached to European dwellings, and found larvae in most of them (88 per cent.).

In most cases no serious attempt at mosquito proofing has been made. In others the proofing has been allowed to fall into disrepair. In the deceased's house, which stands in a thickly populated part of the town and is surrounded by native dwellings, the nearest European house being over half-a-mile distant, I found a cooler (a native earthenware vessel containing water, which, by evaporation of water through its walls, cools syphons, &c.,

immersed therein) in which *Stegomyia* larvae were numerous. This was an experience which I repeated in other European houses.

These water pots, whether in the houses of careless Europeans or in native compounds and houses, are the chief source of *Stegomyia* breeding during the dry season. The tins, broken bottles, and vessels of all kinds which are thrown down at random and apparently never cleared away doubtless form ideal breeding places in the wet season, lying free from disturbance among the rank grass and bush that abounds throughout the town.

There had been very little rain in Abeokuta up to the time of my investigations there, and I did not find larvae elsewhere than in the earthenware pots mentioned, in water-butts, and in one tin in which water had been placed.

Except in some of the better class native houses there are no latrines for natives in this town of 51,255 inhabitants (official census, 1911), the patches of uncleared bush and grass being used for this purpose.

One such patch, with the usual accretion of tins, bottles, &c., I found situated within a few *feet* of the patient's house.

The sanitary conditions generally which obtain in Abeokuta may, without over-statement, be described as deplorable, and as being calculated to foster not only yellow fever, but also enteric disease and (as has already been demonstrated) small-pox.

I have elsewhere mentioned that the native houses, though roofed with corrugated iron, are almost invariably devoid of gutters, so that this source of water-stagnation is not significant. I examined seventeen wells and nine ponds in widely distant parts of the town, but did not find *Stegomyia* larvae in any of them. The water was very low at the time in consequence of the retardation of the rains.

X. *Any recent movements of population suggesting possible introduction of virus*

(A) *Possibility of the introduction of the disease into Abeokuta by railway from Lagos.*—The average number of natives travelling per day between Abeokuta and Iddo (the railway terminus for Lagos) during March, April, and May, 1913, was 110. These

passengers generally carry with them as much impedimenta as the railway regulations allow. The journey from Lagos to Abeokuta occupies between three and four hours.

The virus might, therefore, very well be spread along this route by actual transport of infective cases, and, perhaps, also by transport of infective mosquitoes. No suspicious cases or suspicious high mortality have occurred in the country between Iddo and Abeokuta, through which the railroad passes.

(B) *Possibility of introduction of the disease into Abeokuta* viâ *the Dahomey-Nigeria boundary*.—Considering that the conditions affecting this possibility could be most satisfactorily investigated on the spot, I traversed the Abeokuta-Meko road and the road which runs southward from Meko to the sea, visiting all the villages and towns of importance near the boundary. Mr. Burrows, Comptroller of Customs, very kindly put at my disposal the services of Mr. Messer, Supervisor of Customs on the French boundary. This gentleman met me at Meko and accompanied me throughout the remainder of my journey, and, through his intimate knowledge of all the local conditions, was of the greatest assistance.

It also appeared to me that the distribution of *Stegomyia fasciata* might with advantage be investigated. In the map (facing page 24) the names of the places visited and inspected by me are encircled with red. Those in which *Stegomyia fasciata* were found are further marked with a cross. It will be seen that of the twenty-seven places visited *Stegomyia fasciata* were found in nineteen. It is, of course, possible that they are present in the towns and villages in which I failed to find them. My search was necessarily a somewhat superficial one. The method I adopted was to divide the town roughly into four quarters and to collect larvae from several widely-separated compounds in each quarter. And whenever possible larvae were obtained from pots within the houses rather than in the compounds.

The Medical Officer at Badagri informed me that *Stegomyia fasciata* are present in Badagri Town and in Aiyetoro. In the latter place I had failed to find them. He also informed me that he had found them in Iboro, Igbogila, and Yewa Metta—towns which were not visited by me.

The following is a list of the towns and villages I inspected. A cross after the name indicates presence of *Stegomyia fasciata*:—

Abeokuta. +	Ilaro. +
Lala.	Idawgaw (Dogo). +
Idi Emmi. +	Oke-Odan. +
Aiyetoro. +	Ajilete. +
Meko. +	Ado. +
Idofa. +	Ipokia. +
Tobolo.	Agoshasha. +
Aworro.	Battefin. +
Ijale.	Idi-iroko. +
Ijuwon.	Akolagi. +
Tata.	Ilashe. +
Egua. +	Joffin. +
Agbon.	Badagri. +
Iselu.	

It appears to me that this distribution of *Stegomyia fasciata* is a significant one in regard to the possible introduction of the disease from Dahomey, since the arrival of an infected person in a *Stegomyia*-infested area might easily convert such an area into a propagating centre for the disease. And it will be seen from the map that the most important towns, and therefore those which would most naturally be selected by a trader as a stopping place, harbour this insect.

As the result of my enquiries on the spot, I find that there is a constant traffic between Dahomey and Abeokuta, and that it goes by very various routes, and that the traffic between Porto Novo and Abeokuta does not go, except for short stretches, by the road known as the 'boundary road' leading through Joffin, Idi-iroko, Ilashe, Iselu, Egua, Ijuwon, Ijale, Aworro, Idofa, and Meko. The following are examples of the routes followed from French territory to Abeokuta:—

(i) The trade *viâ* Idofa and Meko is mostly from Ketu (in Dahomey) and neighbouring villages. and consists largely of seed cotton and palm kernels. (Whilst camped at Idofa I saw several natives passing through from Ketu, some being bound for Meko, others for Abeokuta.)

(ii) At Tobolo I was informed by the village headman that traders constantly pass through *en route* for Abeokuta, travelling from Ketu and proceeding *viâ* Aiyetoro.

(iii) At Ijuwon a large number of people pass carrying snails to the Abeokuta market from Porto Novo. This is a fairly regular trade. They first travel inland by the French railway and then cross the border at Ijuwon.

(iv) At Egua the village headman informed me that there is a considerable through traffic from Dahomey to Abeokuta.

(v) At Iselu I was similarly informed, and Mr. Messer tells me that he has many times seen people in this village *en route* from Porto Novo to Abeokuta. Such people mostly come up by rail as far as possible and then cross over the boundary.

(vi) At Ilaro there is a considerable trade in dried fish, which is brought from Porto Novo (the centre of the dried fish trade) *viâ* Ilashe and Oke-Odan, and carried on to Abeokuta.

(vii) At Idawgaw (Dogo) there is a similar trade in dried fish, the natives carrying it through to the markets at Ilaro, Aiyetoro, and Abeokuta, and bringing it from Porto Novo.

(viii) At Ipokia I saw dried fish in the market place which had been carried from Porto Novo. I also saw a native trader here who had come from Abeokuta, selling cloth, and was bound for Badagri. He informed me that there were others engaged in this trade between Abeokuta and Badagri. (Badagri is approximately seven hours by canoe from Porto Novo.)

(ix) At Joffin there is a considerable through traffic from Dahomey, some of which goes to Abeokuta, usually *viâ* Oke-Odan and Ilaro.

(x) There is also a canoe traffic from Porto Novo to Badagri and to Lagos (where passengers proceed by railway to Abeokuta). The average number of market canoes per month passing from Porto Novo to Lagos is twelve. The average number of passengers in each canoe is forty-five.

Hence it will be seen that movements of population affecting Abeokuta, as instanced above in paragraphs (A) and (B), are considerable, and imply wide possibilities of the introduction of disease.

I would here add that the direct journey from Porto Novo to Meko by road occupies five to six days, and from Meko to Abeokuta two to three days.

In addition to routes such as those indicated in paragraph (B) there are many minor footpaths and hunters' tracks leading across the boundary as well as water-crossings on the Ajara Creek and Iguidi River, and these minor ways are largely used by smugglers, of whose trade, chiefly in Dane guns, powder, and spirits, the Egba (Abeokuta) traders appear always to have made a speciality.

As I had been informed by the District Commissioner when in Abeokuta that a proportion of the trade between Porto Novo and that town is carried on by Haussas, who have a settlement of some size in Abeokuta, I had visited this settlement and interrogated some of them. They denied that there had been any cases of sickness or death among their people for 'many months.'

I made careful enquiries in all the towns and villages I visited as to the past and present health of the populace, but with the exception of one town I elicited no fact bearing upon this investigation. The exception was Ilaro, a town of some size in the Badagri District. It has no European inhabitants. The Church Missionary Society's native teacher informed me that for three months (May, June and July) there had been a rather exceptional number of deaths among children, most of whom appeared to suffer from the same symptoms. He had lost one of his own children a few days before my arrival. He said that all the fatal cases are about three years of age; that they die within nine days of onset of the disease; that the symptoms commence with 'fever,' then there is 'stomach burning' (? colic), then 'the white part of the eye becomes yellow,' and if death is going to ensue the 'black part' (? pupil or iris) becomes 'red.' There is anorexia. There is no vomiting, and a normal quantity of urine is voided. The bowels are, as a rule, open, the motions being neither black nor yellow, but intermediate between the two, in colour. They do not contain blood. Several natives corroborated the man's description and statement.

I remained in Ilaro for several days in the hope of seeing some of these cases, making house to house inspections, and instructing the local vaccinator and the native teacher to enquire for cases

throughout the town. I also interviewed the chief, and invited his co-operation in persuading his subjects to consult me. But the bush-natives' prejudice against European medicine when practised by a newcomer proved too strong. Only two sick children were brought to me, both of whom proved to be suffering from malaria, and several instances were brought to my notice of sick people having been actually removed from the town to distant farms on the arrival of 'the white doctor.'

I, however, saw one woman whose case (Appendix 3) is of special interest. Her case incidentally illustrates the difficulty of medical investigation among the natives in the 'bush.' When I first saw her in her hut, I brought away with me to my tent some of her urine to test. On the following day I despatched my interpreter with a message to the effect that a further sample was to be sent in a bottle in the course of the day. The bottle duly arrived, and was found to contain some *plain water*. I then visited her with my interpreter, and (as her action might have been prompted by fear) explained there was nothing at all to fear from the white man (an announcement that had already been made to the people by the chief through the medium of the town crier). She expressed her contrition for sending me plain water, and for trying to deceive, and emphatically denied being in the very least afraid of me. I expressed my satisfaction, and we parted on the most friendly terms, and with her assurance that she would send me some of her urine as soon as possible. In due course another bottle arrived, this time containing urine which proved, on testing, to be *normal*. Now, on the previous day it had been highly albuminous. My interpreter was accordingly despatched with instructions to supervise the act of micturition as closely as the etiquette of Ilaro society would permit, and only thus was I enabled to obtain a genuine sample.

(C) Since, on the assumption of the endemicity of yellow fever in Southern Nigeria, it is possible for the disease to have been introduced into Abeokuta (if not actually endemic there also) from unknown sources within the Colony, I complete this account of important routes into the town with the one leading eastward *viâ* the town of Asha. This is used, I am informed, by those travelling by road between Abeokuta and Ibadan (distance approximately 60

miles). There is, of course, also the railway route which extends northward viâ Ibadan into Northern Nigeria.

XI. *Disturbance of soil*

As in the history of some past epidemics of yellow fever the outbreak has apparently coincided with extensive disturbance of soil, I would here mention that up to the 10th May about $2\frac{3}{4}$ miles of trenches had been dug in Abeokuta for the reception of water-pipes. The house occupied by the European mentioned on page 1 was distant half a mile, and the house in which the native (Appendix 2) lived, was situated a quarter of a mile from the nearest point of disturbance. I would add that there were no collections of stagnant water in the excavations.

XII. *Conclusion*

The case about which this investigation centres is of particular interest and importance in that it occurred as an isolated instance of the disease in a European in a large native town (one of the largest on the African Continent) under, in some respects, very clear and unambiguous circumstances.

I have thought it desirable to summarise these circumstances with special reference to the observations by Sir James Fowler on yellow fever in West Africa, which have lately been circularised to Medical Officers in the Colony.

(The numbered paragraphs are those of Sir James Fowler's observations.)

1. The view of the endemic character of yellow fever in West Africa, which is now generally associated with the name of the late Sir Rubert Boyce, although he did not originate it, is accepted, i.e., the natives, rendered immune by infection, are the reservoir of the virus.

The patient left Abeokuta for Lagos on the afternoon of the 10th May. At 10 o'clock on the same evening the disease began to declare itself. Therefore, since he had not been away from Abeokuta for three months previously, he must have become infected in that town.

Since there had been no suspicious cases of disease among the

non-natives in Abeokuta, it follows that the insect which infected him received its virus from a native. (Conceding that the cases of the two seamen—9 and 10, Table 3—admitted to Lagos Hospital on the 9th and 15th March were mild cases of yellow fever, it would be a very remote possibility that they were the source of the patient's infection.)

2. It has been proved by experiment that the manifestations of this disease vary greatly in intensity; in practice the severe form is comparatively easily recognized, the milder form only with great difficulty.

The native cases in Appendices 1, 2 and 3, and the European cases in Table 3, perhaps illustrate this variation in intensity.

From a limited experience of the disease I hesitate to venture upon a positive assertion, but I would remark that the cases I have had the opportunity of observing since the commencement of the epidemic in Lagos seem to demonstrate that the salient feature, at any rate as far as natives are concerned, is the presence of an otherwise unexplained albuminuria, and it seems to me that it is only in the absence of such an albuminuria, which is said to occur in mild cases (*Touatre*), that the diagnosis can be in doubt.

3. The intervals between the occurrence of well-marked cases are often considerable, but the attempts to prove that recent epidemics and cases have been due to the introduction of the virus from without (e.g., by an infected ship) have so far failed.

No case of yellow fever has ever been reported from Abeokuta before the occurrence of the one under consideration. The possibility of the introduction of the disease into that town *viâ* Lagos from an infected port outside the Colony (e.g., from Accra, which was in quarantine from 15th March to 10th April, or from Grand Popo (Dahomey), which was in quarantine from 18th February to 12th March) is very remote.

4. If it comes from the hinterland, or is brought overland from neighbouring foreign colonies, it is still endemic, though possibly not amongst our people.

As shown in section X, there is a free communication across the Dahomey-Nigeria boundary, but I have obtained no evidence that the infection was introduced from the French Colony. Infective fevers, when introduced into non-immune communities, quickly

declare themselves in epidemic form, and there appears to be no reason why yellow fever (making due consideration for the characteristic cycle of the organism as far as it is known) should be regarded as exceptional in this respect. The fact of no *known* epidemic of the disease having occurred among the natives in Abeokuta as a sequel to this case suggests that (i) either the native has a partial natural immunity, so that he acquires the disease only in a modified form, (ii) or that he has acquired immunity. In either case the disease must be endemic.

5. Epidemics in the past have often commenced in seaport towns and have spread inland; rarely from inland towards the coast.

I would suggest that this is due to the fact that Europeans are congregated mostly in seaport towns, and that it is, therefore, in these towns that the virus has most opportunity for exaltation. The patient, as shown in section IV, had indifferent health prior to his attack by a virus which, in a person of normal resistance, might have produced only a mild and, perhaps, unrecognised manifestation of the disease.

6. Assuming that in some such case it has not spread from an infected ship, non-immune sailors have been first attacked because they live carelessly when on shore.

The patient's case does not elucidate this aspect of the matter.

But it is of interest to note that of the ten cases in Table 3 six are seamen.

7. Recently arrived Syrians, who are now often the first to be attacked, are the non-immune Europeans who live in closest contact with the natives.

The one Syrian trader in Abeokuta had been resident six years. He has since contracted the disease—nearly three months after the European case from the town.

8. After many epidemics of yellow fever, as of other diseases, it has been remembered that the severe cases were preceded by mild cases, the nature of which was not at the time recognized, but which, judged by subsequent experience, were probably examples of the same disease.

The case described in Appendix I was recognized only because a special vigilance was being exercised. It may well be that many

other similar undetected cases occurred among natives, not only after, but also antecedent to, the European case.

9. In these mild cases the virus was gaining in intensity by transmission through one or more non-immunes, either Europeans or natives, and when increased virulence had thus been gained infection of a non-immune was followed by a typical attack of the disease.

As already stated, the patient had indifferent health prior to his attack by a virus which, in a person of normal resistance, might have produced only a mild and, perhaps, unrecognized manifestation of the disease. If, however, the virus underwent a process of exaltation before infecting him, it must have done so through non-immune natives.

10. If this is true, an outbreak of yellow fever should be preceded by mild attacks of fever, *proved not to be due to malaria*, occurring in non-immune Europeans or natives, and presenting symptoms suggestive of yellow fever, such as have been shown to follow the experimental transmission of the disease.

See remarks under paragraph 8.

11. The direction, therefore, to search for evidence of fevers occurring or having occurred in natives, and especially in native children, shortly before an epidemic of yellow fever requires to be supplemented by a similar direction as regards non-immunes, whether native or European.

As stated in section VIII, no suspicious cases had been noted in Abeokuta previously to the patient's illness.

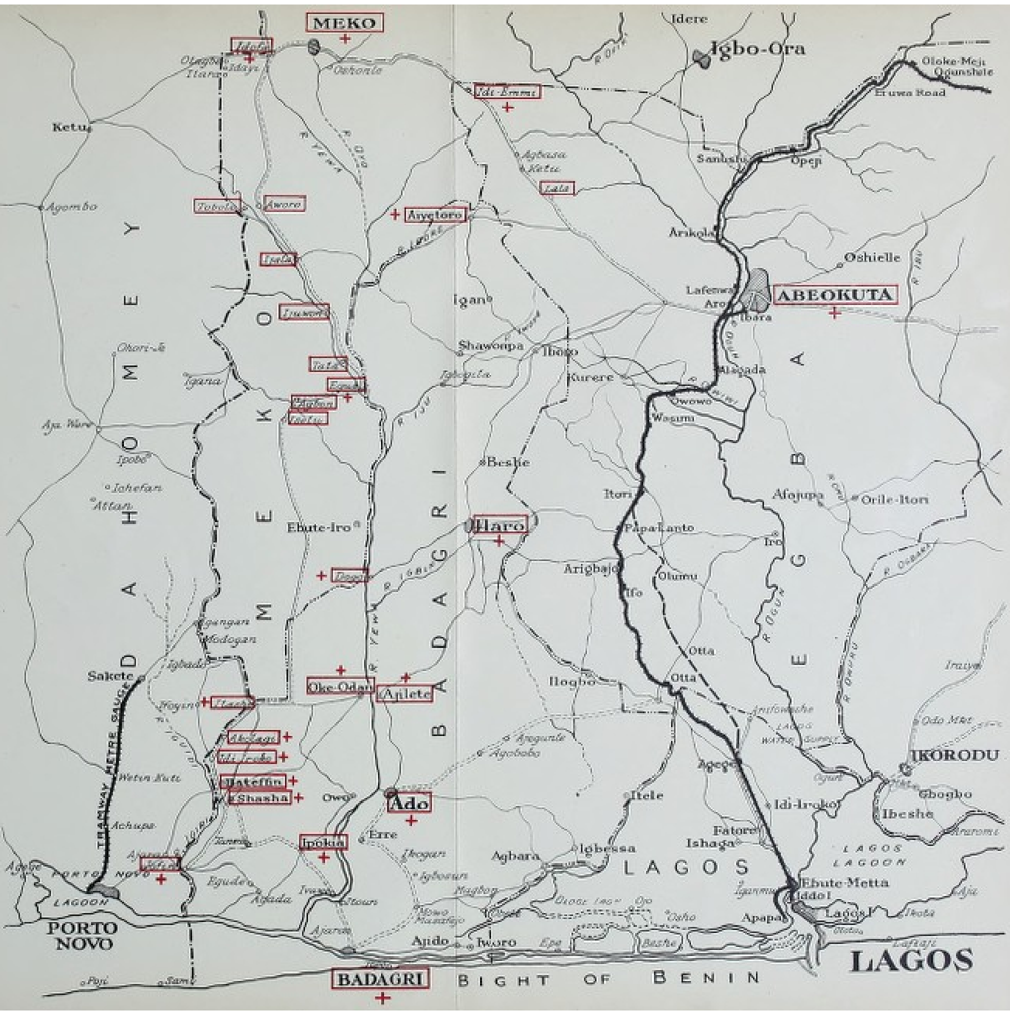
Conceding that Cases 9 and 10 (Table 3) are instances of mild yellow fever in Lagos, actual transmission to Abeokuta of an insect infected from them, or transmission of infection *viâ* a native, has to be supposed.

12. Special enquiry be made to ascertain if natives regard certain illnesses as almost belonging to early life as what we call 'childish ailments.' The 'childish ailments' of a people represent its endemic diseases.

I have been able to gain no information on the subject of such 'childish ailments,' except the description given me at Ilaro set out in section X.

E. J. W.

22nd August, 1913.



MEKO
Idere
Igbo-Ora
Oloke-Meji
Ogunshole
Eruwa Road
Ketu
Agombo
Idi-Emmi
Aiyetoro
Sanushi
Opeji
Arikola
Oshielle
ABEOKUTA
Lafenwa
Aro
Ibara
Igan
Shawonpa
Ibaro
Kurere
Owowo
Wasimi
Beshe
Itori
Afojupa
Orile-Itori
Ebute-Iro
Ilaro
Papa-Lanto
Iro
Arigbajo
Olumu
Ifo
Otta
Ilogbo
Sakete
Oke-Odan
Ajilete
Ado
IKORODU
Idi-Iroko
Gbogbo
Ibeshe
Itele
Fatore
Ishaga
Agbara
Igbessa
LAGOS
LAGOS LAGOON
Ebute-Metta
Iddo I.
Lagos I.
Apapa
Ipokia
Erre
PORTO NOVO
Ajido
Iworo
BADAGRI
BIGHT OF BENIN
LAGOS
D A H O M E Y
M E K O
B A D A G R I
E G B A
TRAMWAY METRE GAUGE

Appendix 1.

The patient was a well-nourished boy aged 12 years. When first seen by the Father Superior (Catholic Mission) he complained of severe frontal headache, malaise, and anorexia. He denied any dietary indiscretion. Temperature, 100° F. Tongue clean. No anaemia. No splenic enlargement. No albuminuria. He was given four grains of quinine and a saline purge.

Evening of the 2nd day:
Temperature, normal.
Albumen (a cloud) present.
Tongue furred, but edges and tip clean.
Patient complained of languor.
The Father Superior gave him a saline purge and communicated with me.

Third day.—Seen by me:
Patient did not look ill, but complained of feeling tired.
Temperature, normal.
Pulse, 96.
Chest and abdomen, normal. No epigastric tenderness.
No splenic enlargement.
Tongue, dorsum coated, edges and tip clean.
Throat, normal.
Ears, normal.
Eyes, not jaundiced.
Urine: acid, sp. gravity 1020. No casts. A cloud of albumen.
He has not had any vomiting or abdominal discomfort.
He has no pains in the limbs or body.

Fourth day.—No change.

Fifth day.—Feels quite well. Urine now free of albumen; specific gravity 1022. No jaundice. Tongue very slightly furred. Pulse 96. Temperature, normal.

Blood examination on 3rd day of illness:
Polymorphonuclears, 59½ per cent.
Large mononuclears, 10½ per cent.
Small mononuclears, 17½ per cent.
Eosinophils, 12½ per cent.

No parasites found.

As helminthiasis of one kind or another is exceedingly common among the natives, the eosinophilia may reasonably be attributed to this cause.

Commentary

While in charge of native out-patients at Lagos Hospital, before undertaking the present investigation, I encountered several cases of mild pyrexia complaining of slight symptoms such as frontal headache, nausea, &c., in whose urine I found a little albumen, and whom I admitted to hospital.

Dr. Leonard, the Resident Medical Officer, who has charge of

in-patients (and whom I have to thank for several useful suggestions regarding the course of my investigation), has forwarded the details of these cases.*

In view of their anomalous character and of their possibly infective nature we thought it very desirable that they should be carefully recorded, and it is for a similar reason that I am sending the record of this one.

It seems to me that the slight pyrexia, together with the character of the tongue, and the development of albuminuria on the second day, are very suggestive features.

I was unable, either at the time of his illness or subsequently, to discover any other cases of similar nature in or around the patient's residence.

Appendix 2

(i) Copy of post-mortem notes, and (ii) notes of the case of a native of Igbere (Igbere is one of the districts into which the town of Abeokuta is divided); (iii) commentary. The information upon which the notes of the case are based was obtained by me from the deceased's uncle, with whom he lived.

(i) *Copy of post-mortem notes by the then Medical Officer, Aro, Dr. A. E. Neale.*

Post-mortem examination of a male native at Aro mortuary, 23rd May, 1913.

The body was that of a native boy apparently about the age of 15 years.
There were no marks of injury on any part of the body.
The eyeballs were prominent and jaundiced.
On dissection I found the—

Heart: healthy—full of blood clot.
Lungs: showed hæmorrhage into the right lower lobe.
Chest cavity contained blood clots.
Stomach: inflamed and containing round worms and blackish liquid—not gritty. On further examination this proved to have elements of disorganised blood.
Liver: Very large and yellow—bile-stained throughout.
Spleen: Very black, normal in size.
Kidneys: haemorrhagic.
Intestines: inflamed.
Brain: much congested at the base, with small blood clots.
There seemed to be slight appearances of fracture of the base of the skull, but no fracture could be found.

* Vide report on Certain Outbreaks of Yellow Fever by Dr. T. M. R. Leonard, pages 207-316.

(ii) *Notes of the Case*

Deceased was a butcher by trade. He became ill on the day preceding death. On returning home from work he complained of feeling ill, and of having been beaten. He said he had 'pains in the body.' His eyes were noticeably 'red.' He did not, however, look as if he had been beaten, and there were no marks. He 'had fever.' His 'skin was hot.' He vomited once, after partaking of some agidi (native food). He complained of 'headache over the whole head.'

He had not been away from Abeokuta for at least six months before his death. I have been unable to discover any cases of illness or death in the neighbourhood of the house in which he died.

There were numerous water-pots with *Stegomyia* larvae in his and the surrounding compounds.

(iii) *Commentary*

The house in which this boy died is approximately 300 yards from the house occupied by the European mentioned above.

The European left Abeokuta on the 10th May.

The native was taken ill on the 22nd May.

The European case may have been infective to the mosquito on the night of the 9th May, or even earlier.

The period 9th to 22nd May is of just sufficient length to allow the transmission of the disease under normal limits from one person to another *viâ* a hitherto uninfected mosquito.

In the particular case under consideration (assuming it to have been one of yellow fever), the short incubation period (one day, allowing twelve days in the mosquito) and quickly fatal termination in the native might be explained on the assumption that the virulence of the infecting organism was exalted in its passage through the non-immune European host. But, if that were so, one would have expected other cases to develop. These *may*, of course, have occurred and remained undiscovered. I have already had occasion to note the reticence of natives in imparting information.

Appendix 3.

The patient was a woman aged about 20 years.

The illness had begun with frontal headache and vomiting after food.

When first seen she had been ill six days; there was no headache, but she felt, and looked, very ill.

Temperature normal.

Pulse 80.

No jaundice.

Tongue clean.

Spleen not enlarged.
Bowels open normally.
No frequency of micturition.
No oedema. Heart and lungs normal.
Urine: Thick cloud of albumen and bile present.
On the following day:
Slight yellowish tinge of conjunctiva.
Urine: albumen less in amount; no bile.
General condition better. No pyrexia.
Next day:
Conjunctival tinge of jaundice as before.
Urine: albumen lessening.
General condition much improved.

Commentary

The record of this case investigated in the 'bush' is necessarily incomplete. I have no doubt that it was not a case of renal disease or of malaria, and I quote it because it appears to come into line with the cases mentioned in my Commentary in Appendix 1.

Appendix 4

Record of Rainfall at Abeokuta

	1911		1912		1913	
	Average Maximum Shade Temperature	Inches of Rain	Average Maximum Shade Temperature	Inches of Rain	Average Maximum Shade Temperature	Inches of Rain
March ...	No record	6·66	No record	0·70	98·8°	2·90
April ...	95°	8·65	99°	5·98	94·5°	4·09
May ...	93°	9·13	97°	3·40	92·3°	5·19

Appendix 5

Deaths at Lagos

	1910				1911				1912				1913			
	Total Deaths	Rate per 1,000 of Population	Deaths of Children under One Year	Rate per 1,000 of Population	Total Deaths	Rate per 1,000 of Population	Deaths of Children under One Year	Rate per 1,000 of Population	Total Deaths	Rate per 1,000 of Population	Deaths of Children under One Year	Rate per 1,000 of Population	Total Deaths	Rate per 1,000 of Population	Deaths of Children under One Year	Rate per 1,000 of Population
January ...	178	39·5	67	14·8	157	30·8	55	10·8	182	35·7	58	11·4	161	31·6	36	7·0
February ...	138	30·6	56	12·4	127	24·9	41	8·0	129	25·3	49	9·6	131	25·7	33	6·4
March ...	170	37·7	54	12·0	158	31·0	56	11·0	122	24·0	41	8·0	156	30·6	30	5·9
April ...	130	28·8	40	8·8	125	24·5	38	7·4	145	28·5	52	10·2	156	30·6	40	7·8
May ...	123	27·3	35	7·7	115	22·6	48	9·4	146	28·7	48	9·4	163	32·0	64	12·5
June ...	161	35·7	75	16·6	172	33·8	81	15·9	163	32·0	73	14·3	145	28·5	59	11·6

Report No. 2

A case of yellow fever was admitted to Lagos Hospital on Friday, 22nd August, 1913.

When passengers arriving by train were examined on that day, the patient, a male native aged 29 years, was found to be suffering from pyrexia (103° F.).

He was admitted to Lagos Hospital for observation, and the diagnosis of yellow fever was made on the following day.

I at once proceeded to Ogbomosho, where he had been staying for one month and whence he had travelled to Lagos *viâ* Oyo, Fiditi, and Ibadan, immediately preceding his detention.

I. *Actual movements of the patient for three months before illness*

The patient is a trader in cloth.

The following were his movements for the three months preceding his illness as nearly as I could ascertain:

He had travelled from Ogbomosho to Zaria (in Northern Nigeria) and back to Ogbomosho. He had then remained at Ogbomosho for one month. He then proceeded by road to Ibadan; the journey occupied three days. He slept at Oyo (a large town of about 45,000 inhabitants) and Fiditi (an exclusively native town—population about 3,000). He remained overnight at Ibadan (population about 175,000) and left on the following day by train for Lagos (about seven hours' journey). Was examined with the other passengers on arrival and sent to Lagos Hospital for observation.

II. *Prevalence at Ogbomosho and other places visited by patient of any suspicious cases of fever and any recent (suspicious) high mortality among natives at such places, especially native children*

Ogbomosho is a large and dirty town of about 80,000 inhabitants, situated on an extensive, lofty plateau, about 180 miles N.N.E. of Lagos and about 30 miles from the nearest railway station. Neither here nor at Oyo, Fiditi, and Ibadan, was I able

to ascertain the existence of any present or past suspicious cases of fever or of a suspicious high mortality among adults or children. Dr. Green, an American Baptist missionary and medical graduate, has resided at Ogbomosho continuously for two and a half years. He has a small hospital and dispensary, and being well known by, and thoroughly 'in touch' with, the inhabitants, would almost certainly have heard of such cases had they occurred. He accompanied me during my enquiries in Ogbomosho town, which extended over several days, and in the patient's compound, and, indeed, assisted me as much as possible in every way.

III. *Number of Europeans at Ogbomosho and other places visited by patient and suspicious cases of fever amongst them within the last twelve months*

Neither at Ogbomosho, Oyo, or Ibadan have there been any suspicious cases of fever among Europeans. There are no Europeans at Fiditi.

Their number in the places mentioned is as follows:

Ogbomosho, 3 (non-officials).

Oyo, 2 (officials); 10 (non-officials).

Ibadan, 20 (officials); 41 (non-officials).

It is scarcely possible that the patient could have acquired his infection in Ibadan (see paragraph VI). For the sake of completeness, however, I obtained the statistics relating to the town quoted above. I also examined the hospital case-books and *post-mortem* records, with negative result. I should mention that European officials at Oyo apply for medical treatment to the Medical Officer at Ibadan, by whom such cases are entered in the Ibadan case-books, and that non-officials are sometimes treated by the American Baptist missionary (who is also a medical graduate) at Oyo. I took occasion to interview him, and he informed me that no suspicious cases had come under his notice. The Europeans at Ogbomosho are inmates of Dr. Green's household.

IV. *Conditions as regards* Stegomyia *breeding in Ogbomosho and other places visited by patient, and near his residence*

I found from actual breeding out of larvae that *Stegomyia fasciata* is present in Ogbomosho, Oyo, Fiditi, and Ibadan.

The conditions in all these towns for *Stegomyia* breeding are favourable, there being numerous water-pots in the native compounds. Larvae are abundant.

S. fasciata larvae were numerous in the patient's compound at Ogbomosho.

V. *Movements of population suggesting possible introduction of virus.*

The Bale (Chief) of Ogbomosho informed me that there is a free interchange of trade through the town, and instanced as objectives: Northern Nigeria, Dahomey, Ibadan, Abeokuta, and Lagos. Infection might, therefore, easily be introduced into the town from without.

VI. *Conclusions*

I conclude that the patient must have acquired his infection either in Ogbomosho or in Oyo. He *might* have acquired it at Fiditi; but in that case the incubation period must have been fifty-four hours or less. It is scarcely possible that he became infected in Ibadan, since the number of hours between his arrival in that town and his detention at Lagos on the following afternoon would connote an incubation period of (at the most) thirty hours, and the number of hours between sunset on the day of his arrival in Ibadan and the time of his detention in Lagos would imply an even shorter incubation period (twenty-two hours). In spite of the fact, however, that infective *Stegomyia* bite only after sunset, this latter period of twenty-two hours seems here hardly to be of significance, for native houses are, as a rule, exceedingly dark, the interiors being in very many instances maintained in such a state of perpetual night that persons frequenting them would be liable to become infected at any period of the twenty-four hours.

These conclusions as to the locality in which the patient was infected are based on the supposition that the date of his admission to hospital coincided with the first day of his illness. When I questioned him in hospital he denied having any subjective symptoms, or having experienced any in the past few days, though I understand that when previously interrogated by

the Resident Medical Officer he gave the impression that he was, on admission, in the fifth day of the disease. In this latter case he must have acquired the disease in Ogbomosho. Statements of native patients regarding their health are, of course, frequently of doubtful value. Since in none of the towns visited by the patient within a month of the onset of his illness have there been any suspicious European cases, it appears to be clear that (excluding a hypothetical animal source of infection) the patient acquired the disease from another native.

E. J. W.

6th September, 1913.

Medical Report

Yellow Fever. Case No. 15 (*No. 1 from Ogbomosho*). L. 55

Sex: Male.
Age: 29 years.
Nationality: Yoruba.
Occupation: Trader.
Date of Admission: 22nd August, 1913.
Date of Discharge: 7th September, 1913.
Disease: Yellow fever.

History.—Patient was sent to the hospital by the Medical Officer, Ebute Metta, from off the evening train from Ibadan, as he was found to have a temperature of 103°. He was a passenger from Ogbomosho *viâ* Oyo and Ibadan; he had not been in Lagos for the past four to six weeks.

On Admission.—Patient had a temperature of 101·6°. Pulse, 66. Complained of a frontal headache and pains in the limbs. Conjunctivae were injected and red.

Alimentary System.—Tongue pointed and red. Gums red. Liver normal. Spleen normal. Bowels constipated. No vomiting, but nausea present.

Circulatory System.—Heart normal. Pulse, 66, low tension.

Respiratory System.—Lungs normal. Respirations, 24.

Nervous System.—Frontal headache and pains in the extremities and back.

Urinary System.—Urine examination: Acid reaction; sp. gr. 1030; albumen present.

Other Systems.—Conjunctivae injected and red.

Blood Examination.—A few malaria parasites seen. Pigmented leucocytes present. Leucopenia present.

8 p.m. Temperature, 101·2°. Pulse, 56.

23rd August:—

12 a.m. Temperature, 101°.
4 a.m. Temperature, 100·8°. Pulse, 52.

8 a.m. Temperature, 100°. Pulse, 52.
Patient had a fair night. Headache still complained of this morning.
Urine examination: Acid reaction; sp. gr. 1030; albumen present.
12 noon Temperature, 98·6°.
4 p.m. Temperature, 98·4°.
8 p.m. Temperature, 98·4°.

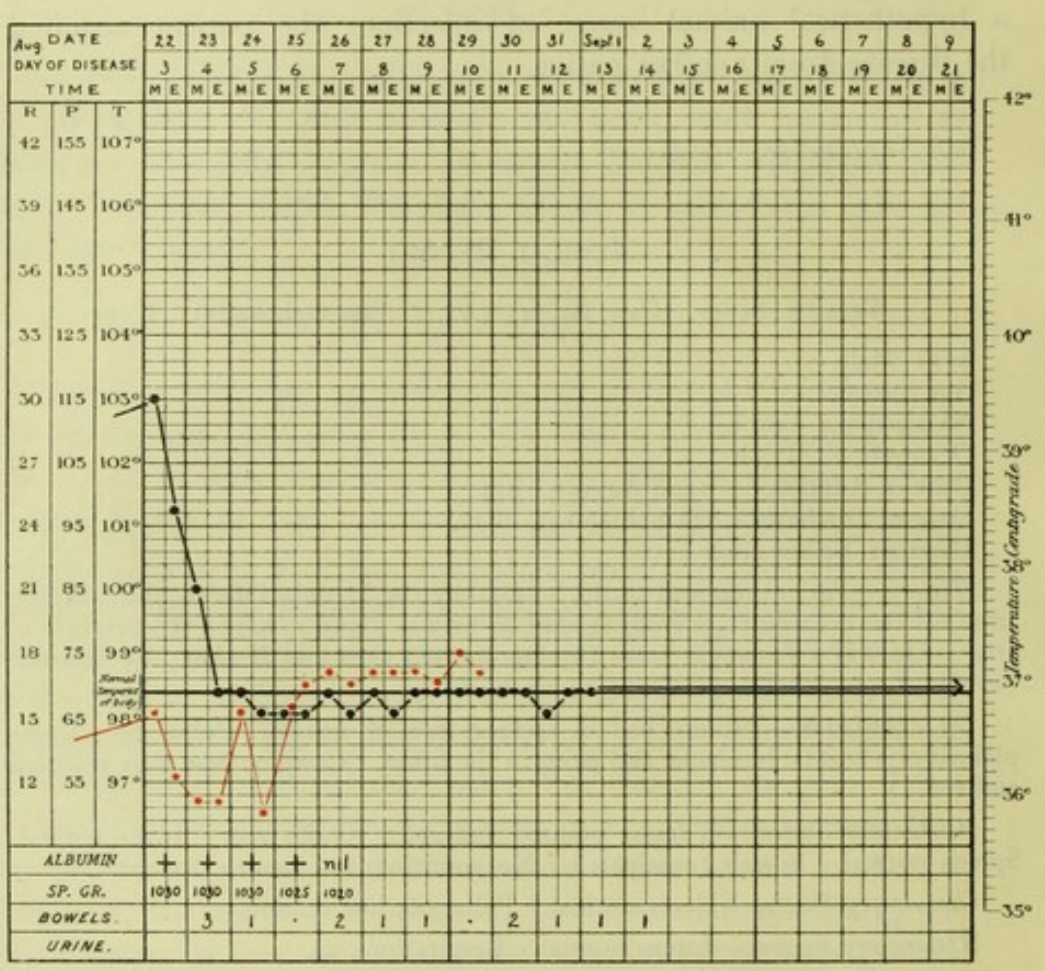


Chart 1.

24th August:—

8 a.m. Temperature, 98·4°. Pulse, 66.
Patient had a good night. Feels very much better; headache only slight. Bowels opened.
Urine examination: Acid reaction; sp. gr. 1030; albumen present.
8 p.m. Temperature, 98·2°. Pulse, 50.

25th August :—
8 a.m. Temperature, 98·2°. Pulse, 66.
Patient had a good night. Slept well.
Urine examination : Acid reaction ; sp. gr. 1025 ; albumen present ; slight.
8 p.m. Temperature, 98·2°. Pulse, 70.

26th August :—
8 a.m. Temperature, 98·4°. Pulse, 72.
Patient had a good night, and is feeling well. Bowels opened.
Urine examination : Acid reaction ; sp. gr. 1020 ; no albumen ; bile present.
Sclerae quite yellow.
8 p.m. Temperature, 98·2°. Pulse, 70.

28th August :—
8 a.m. Temperature, 98·4°. Pulse, 72.
Patient is doing well. Appetite good. Bowels regular.
Urine normal ; no albumen.
Sclerae yellow.
8 p.m. Temperature, 98·4°. Pulse, 72.

Patient continued to do well, and was discharged cured on the 7th September, 1913.

This was one that had been undoubtedly infected in Ogbomosho and not in Lagos, the day of disease being about the third or fourth from the symptoms.

T. M. Russell Leonard,
Resident Medical Officer, Lagos Hospital.

Report No. 3

An investigation carried out at Abeokuta in connection with the case of a Syrian, and three cases in natives. The Syrian and one of the natives were admitted to the French Roman Catholic Mission Hospital; the other two received treatment as out-patients at the Mission.

I have, as on the occasion of sending in my first report, to acknowledge the valuable assistance rendered me in my investigation by the Reverend Father Superior, to whom I am also indebted for clinical notes on all the cases.

The Father Superior is not a medical man, and I have found it necessary to edit my translation of his notes to a certain extent

Case of the Syrian Trader

The illness commenced on the 31st July.

He had not been away from Abeokuta for many months previously with the exception of:—

(i) A visit to Lagos about the end of April. He stayed there one night only. At that time no cases of the disease had been reported in Lagos.

(ii) A visit to Ibadan about the middle of June. Here also he stayed one night only.

As noted in the report of my investigation of the native case which came from Ogbomosho, I ascertained that no suspicious cases among Europeans or natives have occurred in Ibadan, and that there has been no suspicious high mortality there among native adults or children.

Nor does there appear to have been any recent suspicious high mortality among native adults or children in Abeokuta.

For cases that have occurred among natives in Abeokuta see under 'Remarks.'

No cases have occurred among Europeans in Abeokuta since that investigated in my first report.

As regards the patient's personal habits, he says he has 'not been inside two native houses' during the six years he has resided

in Abeokuta, and he is certain that he has not been inside one for at least two years. He informs me that he lives entirely alone, not even a servant sleeping in the house, but about two months before he was taken ill another Syrian trader came to stay with him, and remained for three months, being in good health throughout this time.

This man has since left. The luggage he brought consisted of a small hand-bag containing clothes. The patient's house is in a thickly-populated part of the town, and is surrounded by native houses and compounds, which are in no wise different from those described in my first report.

There are no other Syrians in Abeokuta.

The following is a clinical report of the case compiled from the notes made by the Reverend Father Coquard (who treated the patient) and by Dr. Clark.

Clinical History of the Case

31*st July*, 1913.—The patient, a Syrian trader, aged 26, was seized in the morning at 7 a.m. with shivering, severe frontal headache, violent pain in lumbar region and epigastrium.

He was first seen at 5 p.m. by the Father Superior.

The symptoms were then as above. Also :—

Face flushed.
Eyes injected.
Tongue slightly furred.
No vomiting.
Pulse ' rapid.'
Temperature 102·8° F.

Treatment.—Patient had taken a saline purge in the morning.
Injection of quinoform at 5 p.m.
Tinct. opii, m. 40, at 7 p.m.
Sips of effervescing Vichy water.

1*st August*, 1913.—7 a.m. Symptoms as yesterday, but epigastric pain almost gone and less headache.

Patient had a little sleep during the night.

4 p.m.—Epigastric pain has disappeared.

Treatment.—Sulphate of quinine in cachet.
Vichy water as before.

2*nd August*, 1913. 7 a.m.—Delirium. Yellow bilious vomit. Patient takes no nourishment and is very ' fatigued.'

Tongue furred.

7 p.m.—Condition unchanged.

Treatment.—Antipyrin.

3rd August, 1913.—Patient had no sleep last night.
'Brown' vomit.
Albumen present for the first time, and in large amount.
Haemorrhage from gums; also a few drops of blood after micturition.
Treatment.—Enules of meat and milk.
Saline per rectum.
Injection of quinine.
Chloroform water and solution of perchloride of iron 'for the haemorrhage.'

4th August, 1913. 7 a.m.—Condition generally unchanged.
Has taken a little pasteurised milk.
Treatment.—As before.
The patient asked for rice and was given a little rice-water.
7 p.m.—Patient says he feels better.

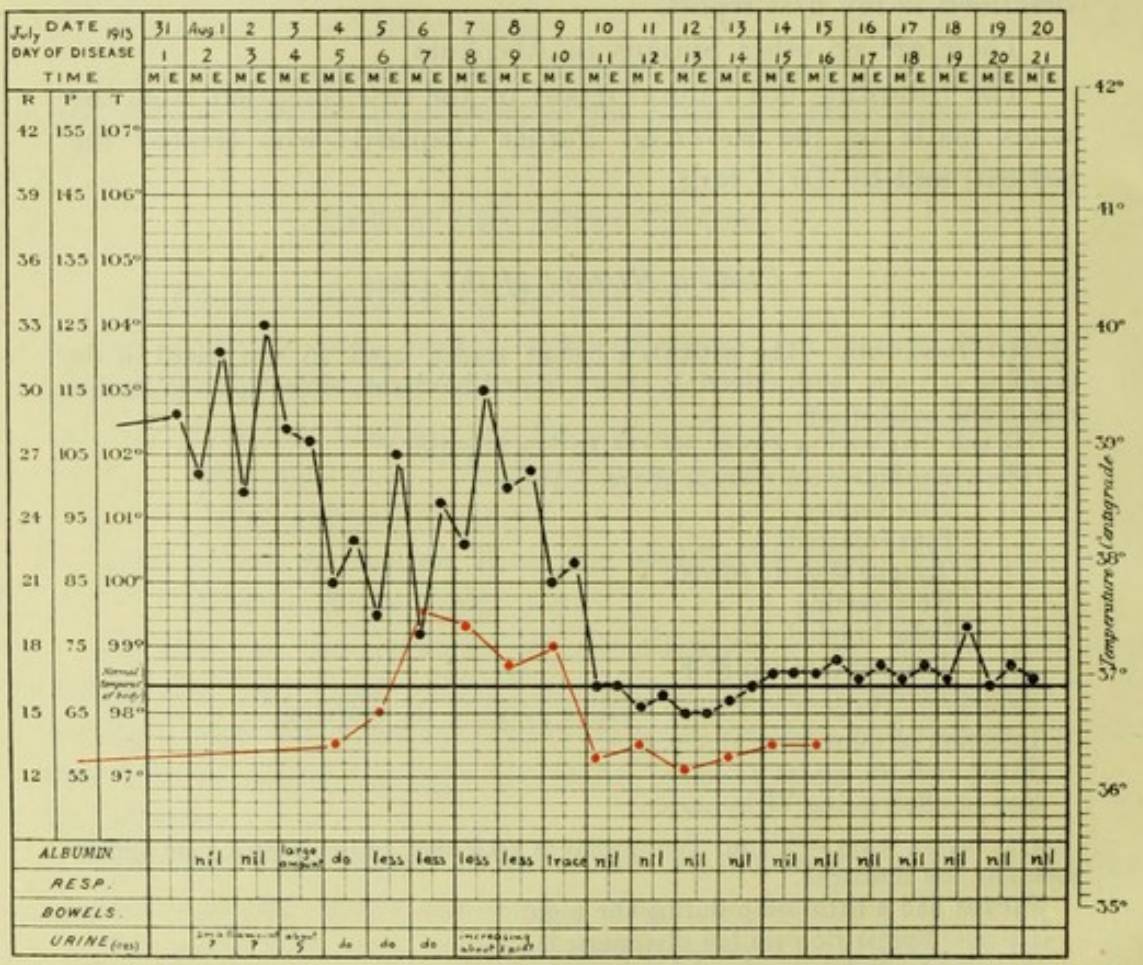


Chart 2.

5th August, 1913. 8 a.m.—Hitherto treated in his own home, patient was now admitted to Mission Hospital.
Conjunctivae jaundiced.
Vomiting has ceased, and the patient has taken a little milk.
Treatment as before.

6th August, 1913. 6 a.m.—Skin jaundiced.
Measles-like rash over face and body; petechial in places.
Brownish vomit.
Treatment as before. Also iced champagne and soda.
7 p.m.—Patient says he feels better.

7th August, 1913. 7 a.m.—Haemorrhages ceased.
Treatment as before, with the exception that quinine is now given per os.
Saline per rectum is continued.
6 p.m. *Treatment.*—Patient able to retain soup and milk.
Quinine again given by injection.

8th August, 1913.—No further haemorrhages.
Treatment as before.

9th August, 1913.—Leucocytosis present.
General condition better.

10th August, 1913.—Temperature normal.
Albuminuria has ceased.
The patient made an uninterrupted recovery.

Cases of Three Natives

Case I :—

Sex: Male.
Age: 16 years.
Date of onset of illness: 10th August.
Date when first presented himself for treatment: 13th August.
Symptoms on 13th August:
Frontal headache.
Albuminuria.
Temperature, Tongue, Pulse, Jaundice — No record.
Course.—Albuminuria disappeared on the 19th August.
No other record.
Treatment.—Saline purge. Quinine. Vichy water.

Case II :—

Sex: Female.
Age: 15 years.
Date of onset of illness: 1st July.
Date when first presented herself for treatment: 2nd July.
Symptoms on 2nd July:
Slight frontal headache.
Albuminuria.
Temperature, 100·2° F.
Tongue furred.
Pulse not noted.
No jaundice.
Patient is nauseated, but has not vomited.

Course.—Albuminuria disappeared about the 8th July.
No other record.
Treatment.—Saline purge. Quinine. Vichy water.

Case III :—

Sex : Female.
Age : 6 years.
Date of onset of illness : 6th August.
Date when first presented herself for treatment : 14th August.
Symptoms on 14th August :
'Fever.'
Albuminuria.
Anorexia.
Nausea, but no vomiting.
Temperature, Tongue, Pulse, Jaundice } No records.
Course.—Albuminuria disappeared on 16th August.
Treatment.—Saline purge. Quinine. Vichy water.

Remarks

None of the patients had been in contact with the Syrian or with one another.

None of them had been away from Abeokuta for three months.

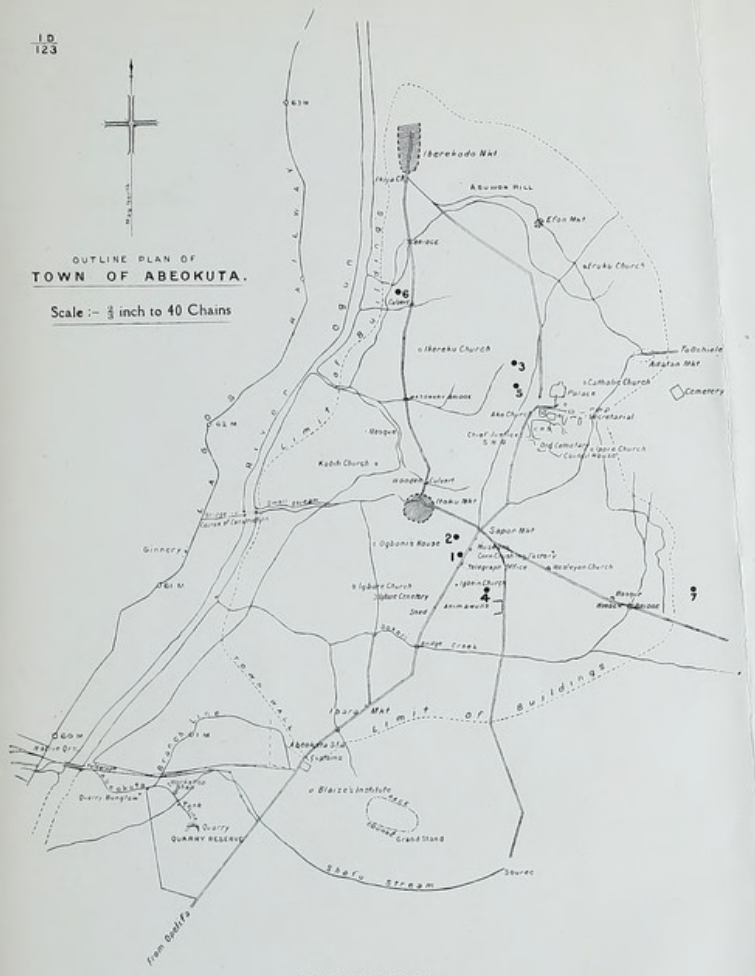
I found their compounds in the usual state of dirt and neglect. In that of Case II there were adult *S. fasciata* in a water pot.

I was unable to discover that there had been any other cases of sickness in adults or children either in the patient's compounds or in their vicinity. (But see below.) In the compound of

Case I there were four children.
Case II there were five children.
Case III there were ten other children.

The following is a list (with dates of onset in chronological order) of *all* cases that have been reported up to the present in Abeokuta :—

1. European case (Report 1), 10th May.
2. Native case (Report 1, Appendix 2), 22nd May.
3. Native case (Report 1, Appendix 1), 19th June.
4. Case II (this report), 1st July.
5. Syrian (this report), 31st July.
6. Case III (this report), 6th August.
7. Case I (this report), 10th August.



EXPLANATION :

1.—European case (Report I).
2.—Native case (Report I, Appendix 2).
3.—Native case (Report I, Appendix 1).
4.—Case II (this Report).
5.—Syrian (this Report).
6.—Case III (this Report).
7.—Case I (this Report).

It is of interest to note that Nos. 1, 2, and 4 (in above list) occurred within a circle of 350 yards radius, and within a period of about 52 days, whilst Nos. 3 and 5 occurred at a distance of about 300 yards from one another, and within a period of approximately 41 days. (See plan of Abeokuta.)

Whilst it is impossible definitely to connect causally any of these cases with one another, it appears to be clear that they must all (including the Syrian) have obtained their infection from a native source.

I have here, of course, assumed that the native Cases I, II, and III, were actually yellow fever, and though the clinical evidence available in the Father Superior's notes is incomplete, the fact that numerous similar cases have recently occurred in the Colony appears to lend a strong element of probability to the assumption.

E. J. W.

15th September, 1913.

Report No. 4

General Introduction

This Report deals essentially with the manifestations of yellow fever on ships and at Warri, Forcados, and Burutu, in the then Central Province of Southern Nigeria.

It has been convenient to divide it into three sections:—

I. Concerning the outbreak at Warri.

II. Concerning certain cases of fever at Forcados and Burutu.

III. Concerning cases of fever upon ships.

Seven appendices are added. Four of these are referred to in the body of the Report. The fifth consists of a Report on pathological lesions, by Dr. Turnbull, the sixth of some photographs illustrating various points mentioned in this and in my Report No. 1, and the seventh of plans and maps. I much regret that a limited experience of photography has militated against the production of better or more numerous photographs.

I am indebted to the Acting Principal Medical Officer for permission to include photographs Nos. 1, 6, 7 and 10, which belong to the local medical records at Lagos.

I have included in Section II a synopsis and tabular statement of the cases therein, as they constitute a well-defined group. This synopsis and tabular statement (and also the records of some other cases in the Report) are unfortunately incomplete, since certain information asked for by me has not been forthcoming.

The information asked for was as follows:—

(i) Records of blood examination with respect to the presence or absence of malaria parasites;

(ii) Records of blood examinations in respect to the presence or absence of *Paraplasma flavigenum*;

(iii) Results of blood examinations—leucocyte counts, etc.;

(iv) Laboratory reports upon organs submitted for examination.

Those cases which have been submitted to Investigators have the Commission Number noted by a †. In some instances, the number was, however, not ascertainable from the Medical Research Institute, and in such a note to this effect is made at the head of the case. In a proportion of these cases headed 'Commission number not available' it is not certain that they were ever submitted to an Investigator; these are marked with an asterisk (*). Where there is no note at the head of a case, this signifies that it was not sent to an Investigator.

I trust that a certain amount of repetition and, in places, a considerable degree of detail may be ascribed to a desire for accuracy, and to a wish to err rather on the side of elaboration than on that of omission.

E. J. W.

26th February, 1914.

Section I

Introduction.—This Section deals with the outbreak of yellow fever at Warri, in May and June, 1913, when two Europeans, engaged at a Factory (Store), contracted the disease—the former with a fatal termination.

Both lived in the same house in the firm's compound, which is

situated on the river bank (see Plans I and II, and map of Warri). The patient first attacked, whose case ended fatally—L. 26—lived in the assistants' part of the house (Bedroom IV, Plan II). Case L. 34 lived in the opposite wing (Agent's Quarters, Plan II).

On inspecting the premises, which are not 'mosquito-proofed,' I found the room which had been occupied by Case L. 26 to be unfavourably situated, both for light and ventilation, and inaccessible to breeze. The windows looked out upon a wall of corrugated iron, fifteen feet distant. It may well be that his resistance to disease was lowered by these conditions. I was informed that a new house was shortly to be erected.

During the daytime, the patient (L. 26) was engaged at his firm's store at Ogbe Ijoh, approximately one mile from the main establishment, but, in the evening, he was accustomed to do office work in the main store—D, Plan I—which is situated a few yards from the residential building.

After his removal to hospital, Case L. 34—the second patient—performed the evening clerical work. This store, which, I was informed, was infested with mosquitoes at that time, had, with the exception of the residential quarters, been the only place largely used by both patients, and the fact that the second patient first complained of illness twenty days after mosquitoes had had an opportunity of becoming infected from the first case, makes it appear probable that he received his infection there. It is, of course, also possible that he was infected from the same source, but in his rooms.

I ascertained that the first patient had almost certainly worked in the store on the evening before his admission to hospital, at which time he was probably in an infective condition.

The following are copies of the reports and charts of these two cases by the Medical Officer, Warri. It may be remarked that Case L. 26 received no quinine treatment, and that Case L. 34 received 5 grains quinine hydrochloride, on the day following admission:—

L. 26†

REPORT BY THE MEDICAL OFFICER, WARRI

On the 22nd May, 1913. I was called to a Factory to see the patient, who had reported himself sick to the Agent that morning.

On inquiry, I found that he was thirty years old, and had come out for the Firm eighteen months previously. He stated that it was his first experience of the tropics, and that he had not had any previous attack of fever. He took quinine regularly.

On examination, the patient was found to be a man of very powerful physique and truculent disposition. The temperature was 103·6°, the head and neck congested, and the eyes suffused. The pulse was 104, the skin was moist, heart and lungs were normal, and neither the liver nor spleen enlarged. There was no inclination to vomit, but the patient was restless and the fever was of a distinctly sthenic type. The bowels had not acted since the previous day.

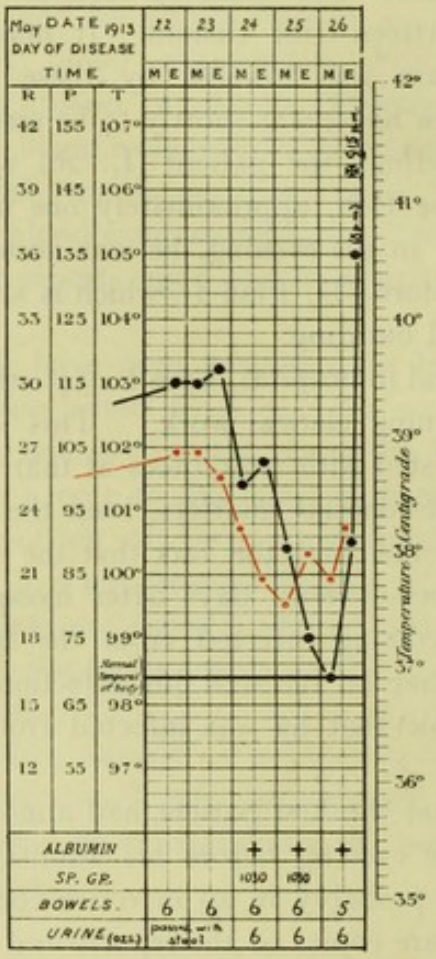


Chart 3.

I at once ordered him into hospital; gave hyd. subchlor. grains 5, and tried to obtain a specimen of his urine. This I found to be difficult on account of the obstinacy of the patient, who refused to pass it except with his motions. There were no parasites to be found in the blood, and, though the temperature and pulse both appeared to be more satisfactory, the general condition of the patient seemed to be serious, and, on the morning of the third day, a catheter was passed, and five ounces of urine, heavily loaded with albumen, withdrawn. On the same day, a remission occurred, and the patient became calmer, but the conjunctivae were jaundiced, and he vomited about six ounces of altered blood. On the morning of

the 26th, the temperature began to rise again, and the vomiting became incessant, and of the coffee-ground type. Salines were given freely throughout the illness, and, during the first three days, liquid nourishment was easily taken.

Death occurred at 8-45 p.m. on the 26th.

Post-mortem.—The heart and lungs were normal; the liver was yellow in colour and cut firmly; the size and weight were normal. There was intense congestion of the kidneys and spleen, but the latter was small and weighed under 4 ounces. The walls of the stomach were injected, and almost the whole of the mucous membrane was haemorrhagic, while the contents consisted of a tarry fluid, similar to that vomited during life.

From the clinical and post-mortem aspects, I must express my opinion that the patient died from yellow fever.

For pathological report see Appendix V, page 196.

L. 34†

Report by the Medical Officer, Warri

Age: 32 years.

Occupation: Agent at a Trading Company, Warri.

Previous History.—He has had ten years' Coast experience. Present tour commenced on the 31st January, 1913, and from that time to the date of present illness he resided at the Factory. He paid week-end visits to Sapele and Gana-

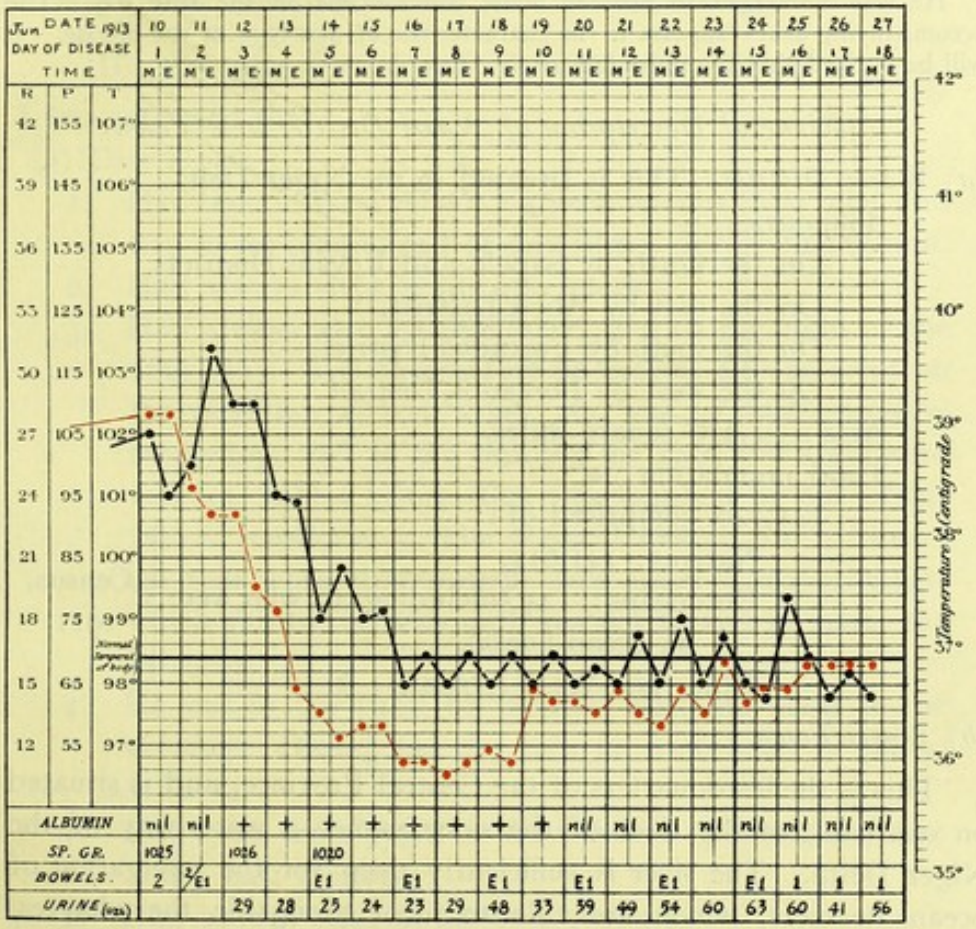


Chart 4.

Gana, but did not leave Warri during the last month. He had not been on the sick list this tour. His quinine habit is reported to have been irregular, and he was careless about his mosquito net.

History of Present Illness.—On the morning of the 10th June, he dressed and proceeded to the beach, apparently in his usual health, but about 10 a.m. he felt ill, vomited, and returned to bed. His temperature was 102°, and he was at once sent to hospital.

On admission, his temperature was 102·2°, the face flushed and eyes suffused. There was no abdominal tenderness or pain, but the patient complained of severe frontal headache. The tongue was thickly coated in the centre, but red at the tip and edges. The skin was dry ; pulse 108. He was screened off from other patients to be kept under observation, and hyd. subchlor. grains 5 given.

On the second day, the pulse was 80, though the temperature was 103°, and this, with the occurrence of albumen on the morning of the third day, was looked upon as settling the diagnosis. Haemorrhages from the gums, nose, fauces, and stomach (coffee-ground) occurred on the fourth day, and jaundice was well marked. He was given Sternberg's mixture at first, and, afterwards, the treatment was symptomatic. With the exception of a little Brand's Essence, he had practically no food for five days.

Vichy water was given and well retained. The temperature fell by lysis to normal on the sixth day, and remained so.

He was discharged to proceed home convalescent on the 16th day. The accompanying chart appears to be characteristic of one type of the disease. It will be noticed that the pulse fell to 50.

I.—*General Description of Warri District and Town.*

(*a*) *Warri District:* This is situated in the Niger Delta.

Boundaries:—

On the north by Sapele and Kevale Districts.
On the east by Aboh District.
On the south by Forcados District.
On the west by Forcados District.

Area:—1,276 square miles.

Total population:—

141,740, comprised of:
Natives: 141,614.
Europeans: 124 (including 49 who were on ocean boats).
Other non-West Africans: 2.

} Census, 1911.

(*b*) *Warri Town*

This is the headquarters of the Central Province, and is situated on one bank of the river of the same name—a water-way of the Niger Delta. The river is sufficiently deep for the navigation of ocean steamers, which are able to moor alongside the wharves.

The town stands upon flat ground and covers an area of approximately 300 acres. Some of the outlying traders' stores are erected on reclaimed swamp.

Total population: 2,567 (Census 1911).

The European population in May, 1913, was: Officials 22, Non-Officials 48, Syrians 1.

There are two native villages of moderate size within approximately half a mile of Warri.

II. *Rainfall and Temperature*

In Appendix III will be found a record of the monthly rainfall, together with temperature observations during 1911, 1912, and the first nine months of 1913. It will be seen, however, that these records do not in any way elucidate the aetiology of the cases at Warri. I quote them in order to maintain a certain uniformity with my reports upon other places, and also as negative evidence.

III.—*Previous Health and Habits of the Patients*

I was informed that:

(*a*) Case L. 26.

1. Had been in West Africa eighteen months (first tour) and had never complained of any illness during this period.
2. Had always slept in his own quarters.
3. Had always used a mosquito net, but on the night of the 16th May—five days before he became ill—he slept on the verandah without a net, and was so much bitten by mosquitoes that in the morning his face and arms were swollen. (This information was supplied by one of his fellow employees.) The Medical Officer also informed me that when first seen he was under a mosquito-net, which fell to the floor and was not tucked in under the mattress.
4. He was in the habit of wearing mosquito boots in the evening. During the day-time he wore boots or shoes.

(*b*) Case L. 34.

1. Had been some years in West Africa (present tour five and a half months).
2. Had always slept in his own quarters.

3. Had always slept under a mosquito-net.
4. Did not wear mosquito boots in the evening. During the day-time he wore boots.

I inquired particularly as to whether either of the patients was inclined to omit the use of the mosquito-net entirely, and was assured by the acting agent of the firm, who was well acquainted with both men, that this was not the case, but that Case L. 34 would occasionally arise at daybreak and lie outside the net, upon a sofa. The occurrence already mentioned of Case L. 26 having slept on the verandah without a net was, therefore, probably exceptional.

It should here be remarked that there had been no sickness among the other four Europeans in the factory or among the native employees (about 40) with the exception of one European, who had fever of one and a half days' duration, about the beginning of May.

IV.—*Actual Movements of the Patients for Three Months prior to their Illness*

Case L. 26 had not been away from Warri during this period.

Case L. 34 had been accustomed to pay week-end visits to Sapele and Gana-Gana, but had not left Warri during the last month.

With these exceptions, neither patient was known to have slept away from his quarters.

V.—*Prevalence at Warri of any suspicious Cases of Fever*

The following is an extract from a report by the Senior Sanitary Officer, who visited Warri in June in connection with the outbreak:

> 'In the endeavour to ascertain if there were any cases, or even suspicious cases, in the district, the Medical Officer let it be known among the Chiefs and people that all patients coming to hospital would be treated free, and that no fees whatever would be charged, but this led to no further information being gained.
>
> 'Inquiries were also made as to any cases of fever occurring in the district, but these only yielded negative results.
>
> 'The Sanitary Inspectors, during their house-to-house inspections, sought and inquired for any cases of illness, but

nothing could be found. Inquiries were also prosecuted among the neighbouring villages, but in his house to-house visits, and in his conversations with the Chiefs, by all of whom he was well received, the Medical Officer was unable to obtain any information in regard to cases of illness, and only saw one sick person, who was suffering from a purely local affection.

'The Commissioner of Police stated that he had received information of a form of sickness which had occurred in 1912, characterized by fever and a dark-brown vomit, but the Chiefs said they had not heard of it, and on inquiry, he had been unable to get any information relating to the affection, and concluded that the report which had been received was incorrect.

'The agents of the European trading firms having made definite arrangements for medical attendance, their European employees receive treatment immediately on complaining of sickness, and the native employees, when they are unfit for work, if they live on the premises, as very many do, are all sent to the hospital at once, so that the records there would immediately show any special sickness occurring at any of the factories. In addition, sanitary inspections are made by the Sanitary Inspectors two or three times weekly, who report daily to the Health Officer, so that he would receive early information of anything exceptional occurring.

'It cannot, of course, be said that the sanitary conditions under which these employees live are in all instances satisfactory, and, I regret to say, conditions such as these are not limited to the employees of the mercantile firms, but also exist elsewhere. . . . . .

'On 18th June, in company with the Provincial Medical Officer and the Medical Officer, Warri, I had a private interview with some of the most influential Chiefs, but could not obtain very much decided information except that there was no special sickness in the district, and that they had no information of any having been present; they, however, specially drew our attention to a disease they called "sebe," which, they said, was characterized by fever, yellow eyes, thick urine, and sleepiness, but there was no vomiting, and no loss

of appetite. The usual duration of the affection was, unless it terminated fatally, which was the case in about 10 per cent. of the cases, stated to be about three weeks. The Chiefs promised to have inquiries made, and to issue instructions that all cases of fever should be taken to the hospital.*

'On 19th June, at an official meeting of the Chiefs, specially summoned by the Honourable Provincial Commissioner, no further information was obtained. I heard from one or two sources that there was an idea prevalent, and one with which the Chiefs were imbued, that if any cases of yellow fever were found in any of their villages, they would run considerable risk of having them burnt down.

'On 24th June, a patient, a man from Sierra Leone, was admitted into hospital, suffering from a condition which was at once diagnosed by the natives as "sebe." He was jaundiced, the urine was bilious, there was no temperature, vomiting, nor pains, and the motions were "clayey." The case was diagnosed as one of catarrhal jaundice, and further observation only led to this being confirmed.

'It is, however, very probable that the term "sebe" refers to more than one affection.'

I took occasion again to interview some of the most influential Chiefs, in the hope of being able to obtain further information, but I have nothing to add to the Senior Sanitary Officer's remarks. I particularly asked the Chiefs to send me any cases of "sebe" that might occur, but without result. Is this disease, perhaps, the same as that mentioned as occurring at Ilaro (see paragraph X, Report No. 1)?

The Medical Officer, Warri, informed me that no suspicious cases of fever had come under his notice. However, bearing in mind a possible confusion between mild and atypical cases of yellow fever and cases of malaria mentioned again in Section VII (below)—(see also Report I, paragraph VIII)—I examined the clinical and *post-mortem* records from January, 1911, up to the time of my investigation (October-November). Out of 105 cases diagnosed as malaria during this period (natives), the presence of

* No cases were forthcoming.—E. J. W.

albuminuria is noted in two, which occurred in 1912, whilst its absence is noted in thirty-five. In the remaining sixty-eight cases there is no record of the urine.

Out of thirty-nine cases which occurred in 1913, albuminuria was noted to be absent in thirty-five; in the remaining four there is no record of the urine. Since examining these records I have been informed that the urine was probably tested in a larger proportion of the cases than my figures show, but that the result was not, in all instances, entered on the chart. (This remark also applies to the European statistics, section VII below.)

Under these circumstances, the figures quoted give no accurate indication of the proportion of cases in which albuminuria was or was not present. Having collected them, however, I quote them for what they are worth, and especially because nearly all the cases in 1913 are recorded.

(The number of cases of malaria given in this and other sections is not to be taken as necessarily representing the exact total treated in hospital during the period under consideration. In some instances the charts or notes have been missing or defective, and the numbers indicate, therefore, only those cases the records of which were available for scrutiny.)

The following are the two (1912) cases (A and B) in which albuminuria occurred. Both cases exhibit a suggestive pulse-rate. It will be remarked that they were both admitted to hospital about the same date. The patients did not live near one another, nor were they, as far as I could ascertain, in any way associated.

CASE A

Sex: Male.
Age: 25.
Race: Native of West Africa.
Occupation: Interpreter.
Date of admission to hospital: 6th March, 1912.
Date of discharge: 16th March, 1912.
Diagnosis: Malarial fever.
No history of the case available.
Patient was treated with quinine throughout.

He was still acting as Interpreter on the occasion of my visit to Warri. I interviewed him and found him to be a man of some intelligence. He was quite positive that there were no cases of sickness in or around his house at Okeli (a native

village in the neighbourhood) at the time of his illness, nor that there was any exceptional mortality among either adults or children.

He informed me that he had not been away from the immediate neighbourhood for some months previous to his admission to hospital.

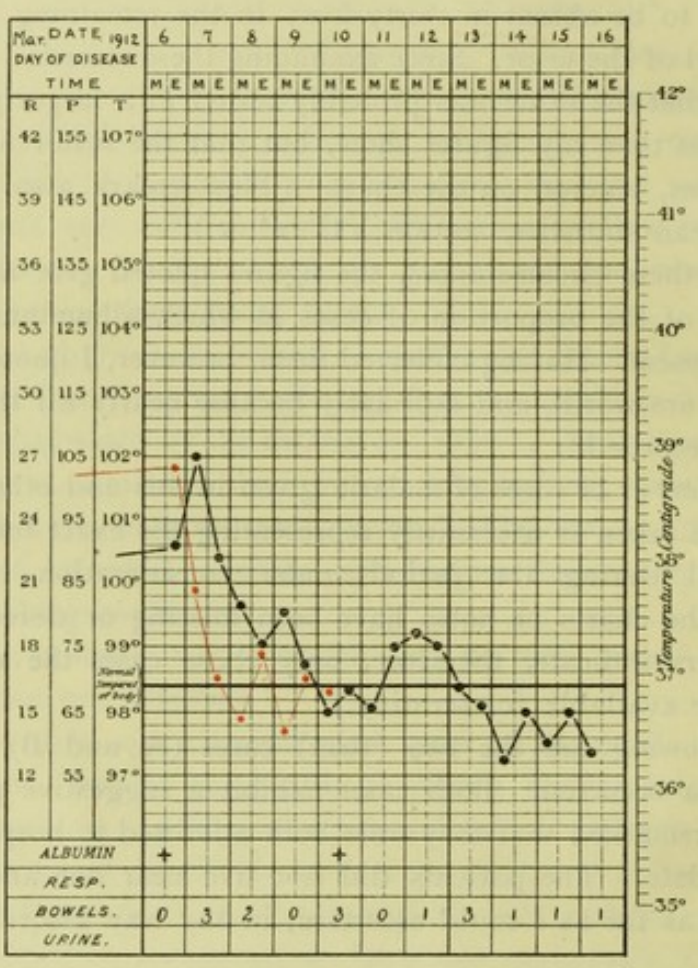


Chart 5.

CASE B

Sex: Male.
Age: 40.
Race: Native of West Africa.
Occupation: Cooper at a Factory.
Date of admission to hospital: 7th March, 1912.
Date of discharge: 14th March, 1912.
Diagnosis: Malarial fever.

No history of the case available. I found on inquiry that the patient had left the firm's employ some months ago, and returned to Accra. At the time of his illness, he had been in the firm's employ for many months.

He was treated with 5 grs. quinine daily.

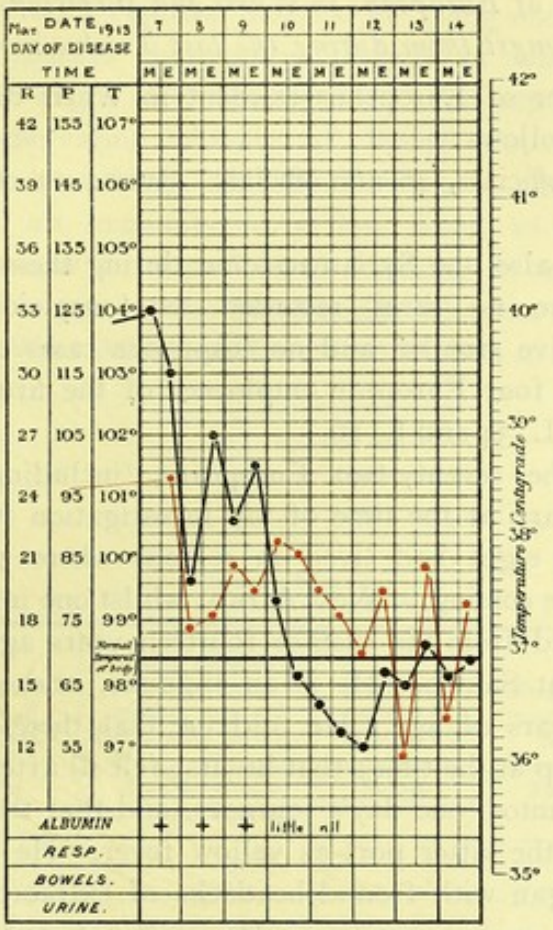


Chart 6.

VI. *Any recent (suspicious) high mortality among Natives at Warri, especially Native Children*

There are no statistics available which would elucidate this.

Registration of deaths is not enforced, and the number registered is negligible, averaging approximately two or three per month. The data available in the Burial Register are also unreliable, the number of cemetery burials being relatively few, whilst the diagnosis of the cause of death has in many cases to be made from description only.

The Medical Officer, Warri, informed me that no exceptional mortality had come under his notice, and the representative Chiefs whom I interviewed on the matter also denied its occurrence in the localities under their jurisdiction.

VII.—*Number of Europeans in Warri and suspicious cases of Fever amongst them during the last Twelve months*

The number of Europeans resident in Warri during May and June was as follows:

May: 22 officials, 48 non-officials. June: 22 officials, 56 non-officials.

There was also one Syrian resident during these months.

There were no cases recorded as 'suspicious' during the preceding twelve months, and no suspicious cases occurred among the remaining four European employees of the firm, either before or after Cases L. 34 and L. 26.

Out of the seventy-two Europeans (including one Syrian) resident in Warri at the time of my investigation (October, 1913), I found that eight had lived in regions where yellow fever is endemic before coming to West Africa, whilst one informed me that he had suffered from the disease fourteen years ago on an ocean-going vessel at Santos. He is an engineer, and was then about twenty-two years of age. He told me that there were no others sick on the ship at the time; that he first felt ill after the vessel had left Rio for Santos (one day's journey), and that the condition was diagnosed at the latter port as yellow fever. He remembers that the illness began with frontal headache of extraordinary violence, and that there was no vomiting. He was prostrated for three days, and was about again in a week.

In view of a perhaps previously acquired immunity, I have collected the figures appended, for the sake of clearness, in tabular form (Table 1). It will be seen, however, that in three cases the interval of residence in a non-endemic area, after leaving the endemic area, was perhaps long enough to have destroyed immunity acquired by residence, in contradistinction to immunity acquired by having passed through an attack of the disease.

None of these persons (with the exception noted) have ever had yellow fever, so far as they are aware. From the same point of view, a table (Table 2) is appended of the remaining sixty-four residents. It will be seen that, as in the similar tables in Section II of this report, and in Report No. I, some of the persons were not actually resident at the time the disease first declared itself, but they are included for the sake of completeness.

While touching on the question of immunity, it will be remarked that the deceased (Case L. 26) was in his first tour, and had been in West Africa eighteen months, i.e., long enough to have his resistance to disease thoroughly lowered in whatever part of 'the Coast' he might have been resident, but especially so in the exceedingly enervating climate of Warri (not to mention his unfavourable domiciliary conditions) without the compensatory advantage of an immunity to yellow fever, which by some is supposed to accrue from prolonged residence in an endemic zone. The patient (L. 34), on the other hand, who recovered, had been some years in West Africa, and was in the sixth month of his tour

TABLE NO. 1

Number	Number of years resident in an endemic area other than West Africa	Period between residence in an endemic area and first coming to West Africa. (Interval of residence in a non-endemic area.)	Number of months in West Africa since last in Europe	Number of months in Warri since last in Europe	Number of months in other parts of West Africa since last in Europe	Number of months in West Africa (not including leave) since first coming to West Africa
Government official	32 years	4 months	9 months	7 months	2 months	33 months
,, ,,	15 ,,	No interval	11 ,,	11 ,,	—	23 ,,
,, ,,	10 months	18 months	6 ,,	6 ,,	—	30 ,,
Non-official ...	Trading for 3 years to West Indies	5 years	1 month	1 month	—	—
,, ...	Trading for some years to West Indies	5 ,,	20 months	20 months	—	About 100 months
,, ...	Engineer on board ship trading to West Indies for some years	5 ,,	1 month	1 month	—	—
,, ...	7¾ years	6 weeks	6½ months	6½ months	—	117 months
,, ...	9 months	—	276 months (23 years)	48 ,,	228 months (19 years)	276 months (23 years)

NOTE.—No. 8 is a Syrian.
No. 6 suffered from yellow fever at Santos about fourteen years ago.

TABLE NO. 2

Number	Number of months in West Africa since last in Europe	Number of months in Warri since last in Europe	Number of months in other parts of West Africa since last in Europe	Total number of months resident in West Africa since first coming to West Africa (not including leave)
1. Government official... ...	10	10	—	About 120
2. ,, ,, ...	3 weeks	3 weeks	—	,, 27
3. ,, ,, ...	9	7	2	70
4. Wife of 3	6	6	—	34
5. Government official... ...	12	6	6	60
6. ,, ,, ...	8	8	—	47
7. ,, ,, ...	2	1	1	28
8. ,, ,, ...	1	1	—	13
9. ,, ,, ...	2	2	—	65
10. ,, ,, ...	7 weeks	5 weeks	2 weeks	72
11. ,, ,, ...	8	4	4	18
12. ,, ,, ...	4½	1	3½	27½
13. ,, ,, ...	5	1	4	80
14. Wife of 13	5	1	4	26
15. Government official... ...	12	11	1	About 144
16. ,, ,, ...	4	4	—	126
17. ,, ,, ...	5	5	—	97
18. ,, ,, ...	11	10½	1 week	72
19. Non-official	7	4½	2½	About 130
20. ,, ...	11	11	—	11
21. ,, ...	10	3½	6½	102
22. ,, ...	20	20	—	44
23. ,, ...	21	19	2	44
24. ,, ...	8	2	6	8
25. ,, ...	5	5	—	5
26. ,, ...	4½	3½	1	4½
27. ,, ...	4	3½	½	51
28. ,, ...	12	3	9	26
29. ,, ...	4	4	—	99
30. ,, ...	24	12	12	24
31. ,, ...	26	2½	23½	26
32. ,, ...	25	25	—	51
33. ,, ...	29	8 days	28¾	61
34. ,, ...	18	18	—	55
35. ,, ...	3	3	—	3
36. ,, ...	6	6	—	6
37. ,, ...	32	32	—	32
38. ,, ...	18	18	—	18
39. ,, ...	6	6	—	6
40. ,, ...	5	5	—	5
41. ,, ...	1	1	—	1
42. ,, ...	3½	3½	—	85
43. ,, ...	25	25	—	103
44. ,, ...	3½	3½	—	3½
45. ,, ...	60	59	1	192
46. ,, ...	4	4	—	360
47. ,, ...	10	10	—	72
48. ,, ...	27	25	2	27
49. ,, ...	—	14	—	—
50. ,, ...	24	15	9	24
51. ,, ...	22	22	—	58
52. ,, ...	8	8	—	76
53. ,, ...	3	3	—	39
54. ,, ...	16	16	—	16
55. ,, ...	11	11	—	11
56. ,, ...	4	4	—	4
57. ,, ...	14	14	—	64
58. ,, ...	4½	4½	—	4½
59. ,, ...	3 weeks	3 weeks	—	3 weeks
60. ,, ...	13½	13½	—	13½
61. ,, ...	6½	6½	—	30½
62. ,, ...	6	6	—	6
63. ,, ...	6	6	—	42
64. ,, ...	20	9	11	20

In view of the fact that atypical and mild cases of yellow fever may escape recognition and may possibly be mistaken for malaria (Guiteras), I examined the available records of cases of malaria among Europeans, from the commencement of 1911 up to the time of my investigation (October-November), particularly with reference to the occurrence of albuminuria.

Out of ninety-four cases, the presence of albuminuria is noted in eight. It is noted as absent in forty-three, whilst in the remaining forty-three cases there is no record of the urine. (Of the forty-three cases in which there is no note respecting the urine, thirty-eight occurred in 1911.)

In five out of the eight cases with albuminuria, the association of this condition with other features appears to be of considerable significance.

In the sixth case the patient, I was told, suffered from a profuse purulent urethritis. Leaving out of consideration in this case (No. 6) the albuminuria, certain other characters make it desirable to include it in this series.

No 'suspicion' attaches to the remaining two cases, which are accordingly omitted.

I would here remark that the question of the interference of a urethral discharge with the tests for renal albuminuria, which, as far as I am aware, has never been accurately investigated, is an important one, particularly in regard to natives, among whom, at any rate in the more 'civilized' parts of the country, gonorrhœa is generally admitted to be very prevalent. Allbutt's 'System of Medicine' states that: 'pus present alone in the urine, unless the amount of it be very large, does not cause more than a trace of albumen.' The investigations into this matter which I have so far been able to make appear to suggest that filtered urine which has contained pus does not necessarily yield a positive test for albumen, and that considerations such as degree of dilution of the pus, interval of time between the act of micturition and the application of the test, etc., have to be reckoned with (see Table 3). It would certainly appear desirable definitely to exclude the presence of urethritis in testing for albumen, but the fact that febrile conditions, at any rate temporarily, inhibit the activity of the gonococcus, here again introduces a possible source of fallacy, and

a reaction for albumen, at the time negative on account of pyrexia, might later, on reduction of temperature, become positive and be wrongly interpreted as a renal albuminuria.

It is obvious that in cases, particularly in natives, where a positive diagnosis of yellow fever may be largely dependent on the presence of albuminuria the question of the possible vitiation of the test is of great importance.

(Up to the time of my departure from the Colony I had tested the urine in seven cases of uncomplicated gonorrhoea. These are shown in tabular form (Table No. 3). I had intended, of course, to collect a much larger number.

Incidentally, the greater delicacy of the boiling test as compared with the nitric acid test, is illustrated. The former test is also to be preferred to the latter in these cases on account of the fact that a precipitate of resinous bodies is produced by nitric acid which might cause confusion in cases where oil of copaiba has been taken. This oil I have seen exhibited for sale to natives.)

TABLE NO. 3

No.	Ozs. of Urine	Discharge	Immediate reaction on boiling	Immediate reaction $\bar{c}$ HNO_3	Reaction on boiling after standing	Reaction $\bar{c}$ HNO_3 after standing
1	2	Copious purulent	+	...	...	...
2	12	Fairly copious purulent	–	...	...	...
3	5	Fairly copious purulent	...	...	Very faint cloud after one hour	– after one hour
4	8	Copious purulent	–	–	Faint cloud after one hour	– after one hour
5	1	Copious purulent	+	–	+ after one hour	– after one hour
6	1	Fairly copious purulent	Very faint cloud	–	Very faint cloud after one hour	– after one hour
7*	5	Copious purulent	...	...	Very faint cloud in first part after 2½ hours. × in second part after 2½ hours	– in both parts after 2½ hours

NOTE.—In each case the urine was filtered before testing so as to obtain a clear filtrate.

* The urine in this case was passed into two separate vessels, the first part consisting of 1 ounce, the second of 4 ounces.

Case 1

Race: European.

Age: 24.

Sex: Male.

Occupation: Trader.

Date of admission to hospital: 13th December, 1911.

Date of discharge: 22nd December, 1911.

Diagnosis: Malarial fever.

There are no notes available of the history or course of the case, except such as are entered on the temperature chart.

He was treated with 5 grs. quinine three times a day, saline aperients, and a mixture of carbonate of bismuth, hydrocyanic acid and chloroform water.

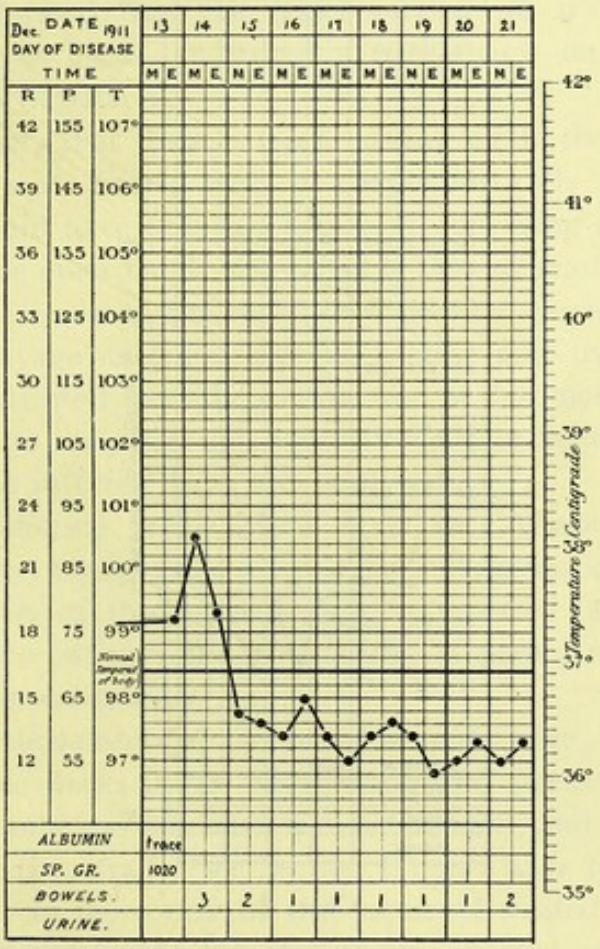


Chart 7.

CASE 2

Race: European.

Age: —

Sex: Male.

Occupation: Government official.

Date of admission to hospital: 20th December, 1911.

Date of discharge: 23rd December, 1911.

There are no notes of the case except such as are entered on the temperature chart.

The treatment consisted of 5 grs. quinine daily and a 'tonic' mixture.

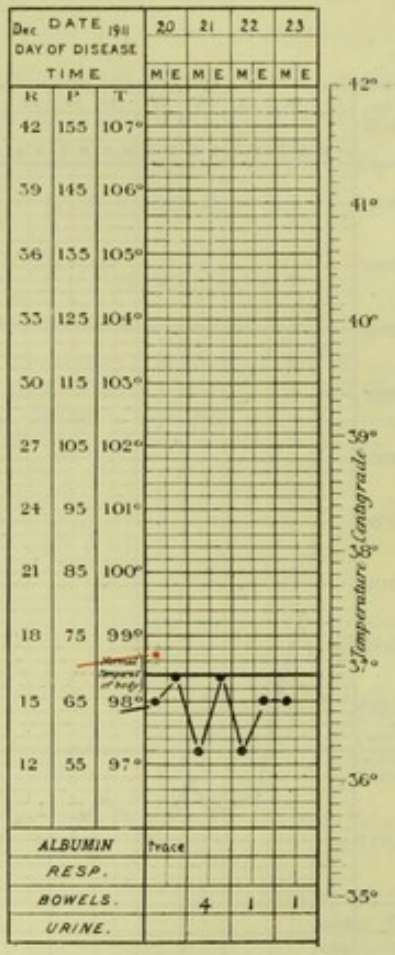


Chart 8.

Cases 3, 4 and 5 (Europeans) came from the s.s. 'Thomas Holt,' a cargo-boat, which was, at the time, lying at the wharf at Warri.

The ship had left Liverpool on the 5th July. The following had been her movements as closely as could be ascertained, kindly supplied to me by Messrs. John Holt's agent at Warri:—

Left Liverpool, 5th July.
Arrived Axim (Roads), 24th July.
Arrived Warri (wharf) *viâ* Duala, 11th August.
Left Warri for various ports on Niger River, 16th August.
Arrived Warri (wharf) from Niger River, 5th September.
Left Warri for Niger River, 12th September.
Arrived Onitsha (Niger River), 14th September.
Left Onitsha, 17th September.

I was informed that the vessel carried no deck passengers (natives) but, as usual, embarked a native crew on reaching the West Coast of Africa.

It is unlikely that these natives, coming off to the ship as they do in open surf boats, with a characteristically scanty spare wardrobe, would have been the means of conveying mosquitoes on board. On the other hand, it is possible that some of these insects, having gained access to the vessel on a previous voyage, may have survived a voyage as stowaways to Europe and back, and may have become infected from the native crew, or that mosquitoes which gained access to the vessel subsequently while in Southern Nigerian waters became infected from the same source.

Natives suffering from yellow fever are, it would seem, not necessarily even temporarily incapacitated from work.

No members of the native crew were reported 'sick,' either at the time of the patients' illness or within a period of some weeks before or afterwards.

From the movements of the vessel set out above, it is seen that she spent some weeks in the Niger River and creeks of the Delta, during which time she may have become infected, and that Forcados with its large river traffic (see Section II) may have been the source of infection. In the course of my inquiry I visited Onitsha, but there is no record in the hospital of any case of sickness having been treated on the 'Thomas Holt' while she was there.

CASE 3. L. 66†

Race: European.
Age: 22.
Sex: Male.
Occupation: Engineer on s.s. 'Thomas Holt.'
Date of admission to hospital: 11th September, 1913.
Date of discharge: 30th September, 1913.
Diagnosis: Malarial fever with albuminuria.

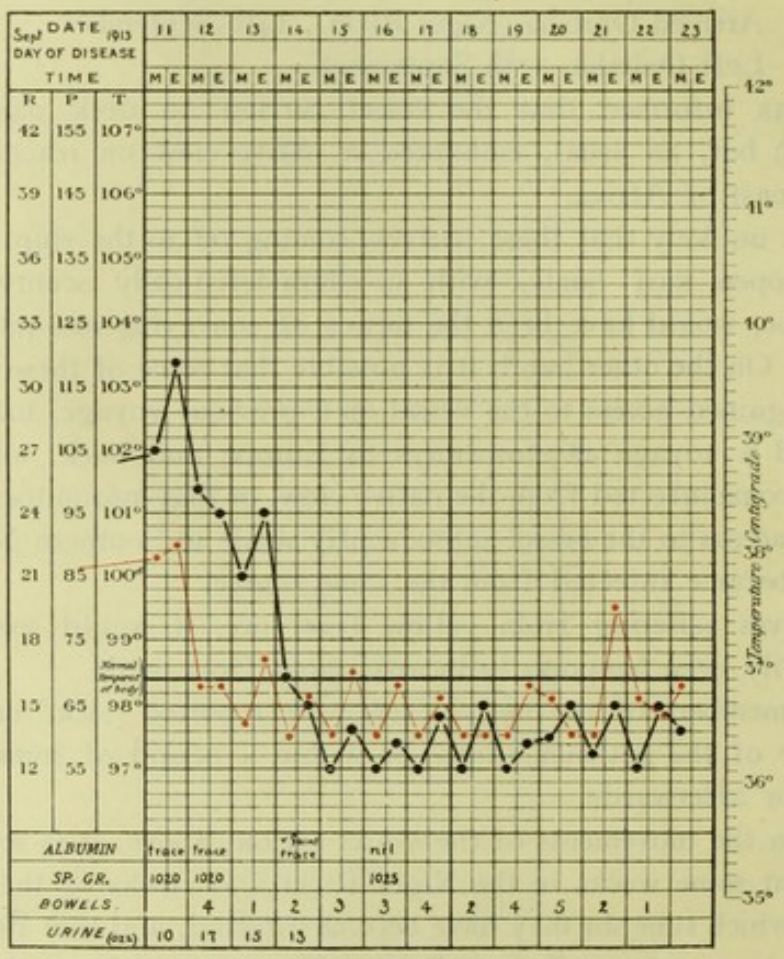


Chart 9.

Case 4. L. 68†

Race: European.
Age: 22.
Sex: Male.
Occupation: Steward on s.s. 'Thomas Holt.'
Date of admission to hospital: 11th September, 1913.
Date of discharge: 30th September, 1913.
Diagnosis: Malarial fever with albuminuria.

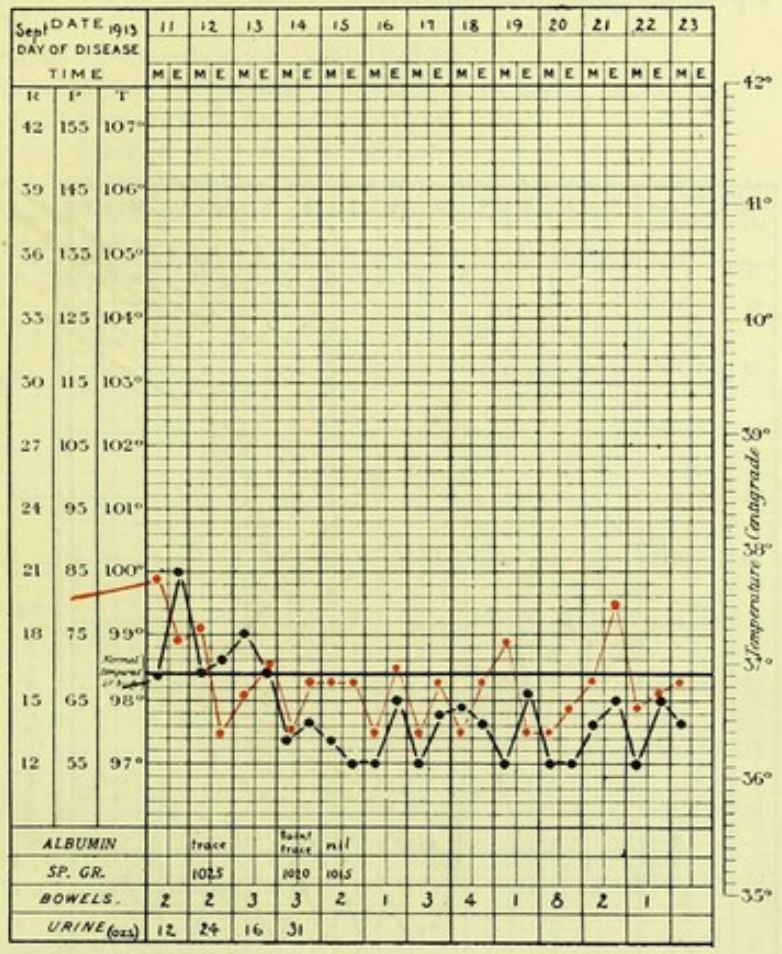


Chart 10

CASE 5. L. 67†

Race: European.
Age: 23.
Sex: Male.
Occupation: Engineer s.s. 'Thomas Holt.'
Date of admission to hospital: 11th September, 1913.
Date of discharge: 30th September, 1913.
Diagnosis: Malarial fever with albuminuria.
The following are the notes of cases 3, 4 and 5, by the Medical Officer, Warri:—

'I was called to see these patients on the afternoon of the 11th instant, and was told by the Chief Steward that they had been ill for two days with vomiting and fever ranging from 104° to 105°. I asked the Chief Steward to take a temperature with my thermometer and noticed that he read it accurately. The patients were at once removed to the European Hospital, and kept in mosquito-proof quarters.

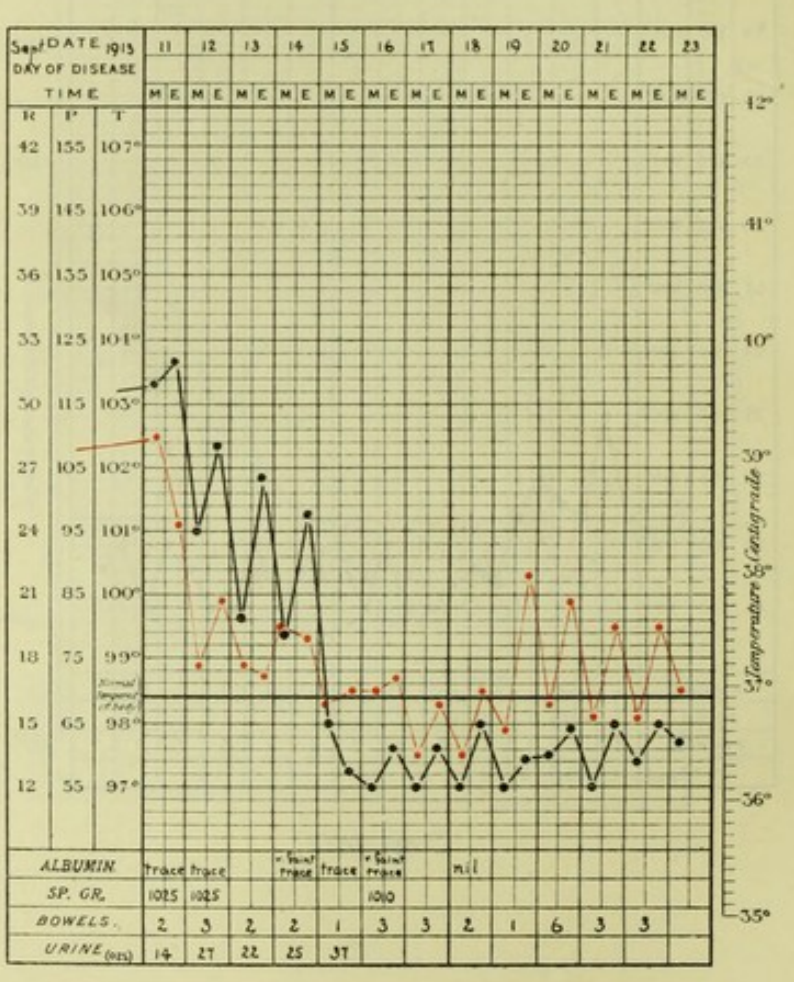


Chart 11

'In 3 and 5 parasites were found, but the blood examination of 4 was negative. All had albuminuria, as will be noted from the accompanying charts, but no vomiting occurred after admission nor any other symptom suggestive of yellow fever.

'Blood films have been sent to Yaba, and I am forwarding a copy of this report to the same quarter. I could find no other cases of fever on the "Thomas Holt," and the agent, who is in communication with it, has heard of no further sickness on board.

'I am of opinion that these are not yellow fever cases, but await the result of the blood examination.'

Cases 3, 4 and 5 received 10 grs. quinine hydrochloride daily.

Case 6

Race: European.
Age: 17.
Sex: Male.
Occupation: Steward on s.s. 'Lulu Bohlen.'
Date of admission to hospital: 3rd September, 1913.
Date of discharge: 10th September, 1913.
Diagnosis: Malarial fever with albuminuria.

The attached temperature chart presents the available record of the case.

The Medical Officer, Warri, informed me, as already mentioned, that the patient had urethritis.

Quinine treatment: 10 grs. hydrochloride daily.

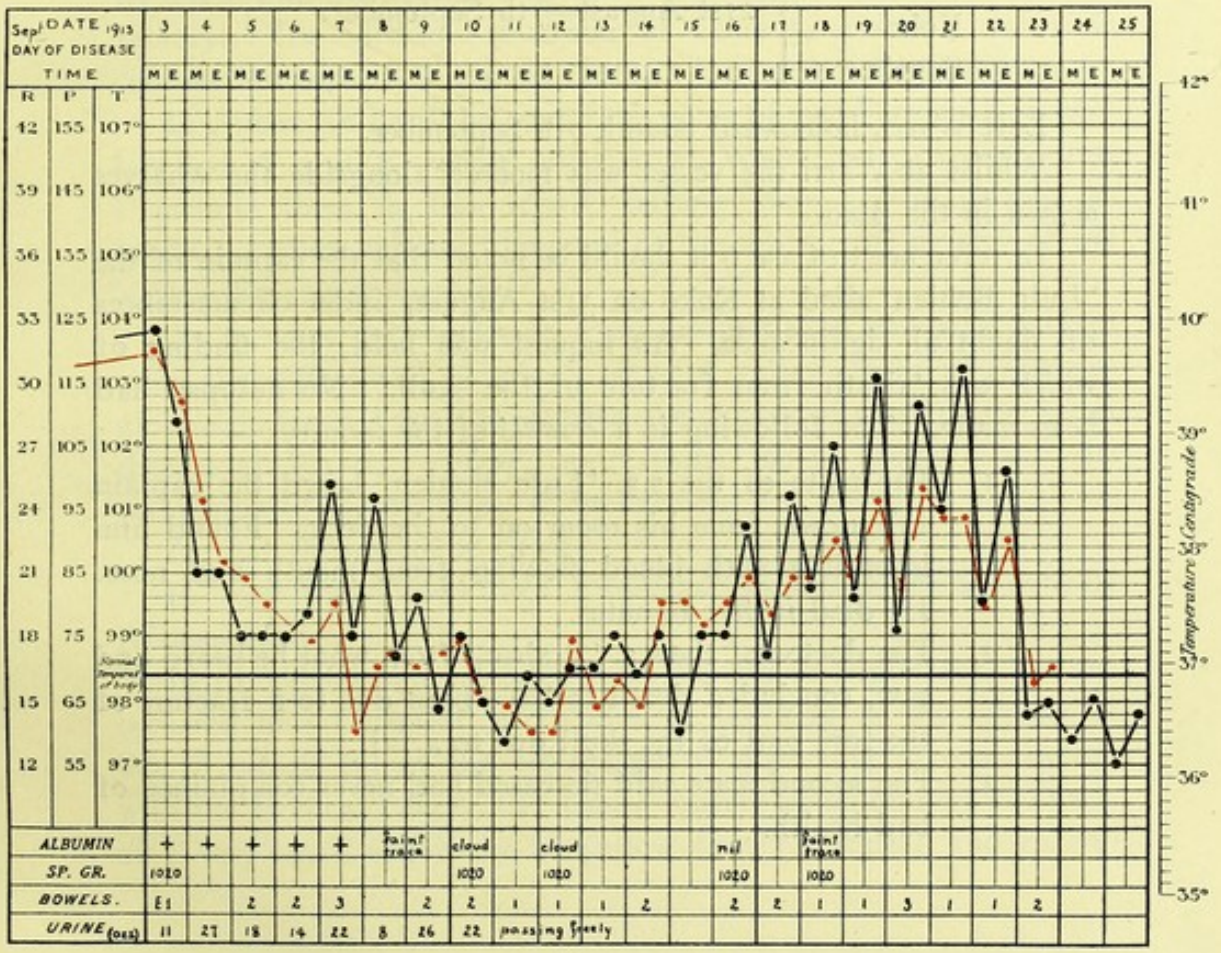


Chart 12

The 'Lulu Bohlen' is a cargo-boat plying between Hamburg and the West Coast of Africa.

On arrival at 'the Coast' she, as usual, embarked a native crew, the possibility of infection through which has already been discussed. She *may* have carried deck passengers, but I have been unable to ascertain this definitely.

The following were her movements prior to the occurrence of the case (it should be remarked that the time-table is not strictly observed by cargo-boats):—

Hamburg, 14th July.
Rotterdam, 18th July.
Las Palmas, 27th July.
Capa Palmas, 6th August.
Accra, Addah } 9-11th August.
Forcados, 13-17th August.
Burutu, Warri, Koko, Sapele } 21st August—7th September.

Left Warri, homeward bound, 7th September.

Whilst at Warri the vessel was moored alongside the wharves shown in the plan.

In reference to Case 6 it should be noted that the captain of the 'Lulu Bohlen' died at Koko on 31st August, under circumstances of doubtful significance. An inquest was held, the finding of which was 'death from fracture of the skull.' No autopsy had been made. The following is a *resumé* of the inquiry:—

1. The mate of the s.s. 'Lulu Bohlen' heard the captain fall down from his room on to the deck. Found him insensible with blood flowing from mouth and nose. He died in five minutes.
2. The doctor of the s.s. 'Prahsu,' from what he heard and saw, concluded death to have been due to a fracture of the fore part of the skull due to a fall.
3. The second mate said deceased had never complained of bad health.

4. The Agent of the African Association (a trading firm) stated that deceased informed him that he was better of late but had been coughing badly.
5. The engineer of the 'Lulu Bohlen' stated that deceased had been feeling sick at night and slightly deaf in the mornings for fourteen days.
6. The finding was that death was due to fracture of the skull, due to a fall.

Of the above six cases it will be seen that:—

(*a*) Nos. 1 and 2 were admitted in the same month and on the 13th and 30th respectively:—

(*b*) Nos. 3, 4, 5 and 6 were taken from ships, the first three from the same vessel and at the same time, whilst in the case of No. 6 a death had occurred on the ship three days before the patient was taken ill and eighteen days after the vessel had arrived at Forcados, where two cases of 'fever undiagnosed' had occurred in natives (in May and July)—see Section II. It is much to be regretted that the available details respecting this death are unsatisfactory. The epidemic character of Cases 3, 4 and 5, taken in conjunction with their clinical features, appears to be significant.

In Appendix I will be found the notes of two European cases—labelled A and B—which occurred at Warri in 1912 and 1913. I include them in this report because they are diagnosed as febricula, which disease forms one of the subjects of inquiry of the Yellow Fever Commission.

As in some text-books on Tropical Medicine emphasis is laid upon the differential diagnosis between yellow fever and haemoglobinuric fever, I have scrutinized the records of cases of the latter disease at Warri. There can, I think, be no doubt about the correctness of the diagnosis in these cases.

In 1911 there were no cases.

In 1912 there were three European cases and one in a West African native.

In 1913 there were no cases up to the end of September, but one occurred in a European in October at the time of my inquiry at Warri, which I had the advantage of observing in consultation with the Medical Officer. If I may venture an opinion on the basis of a very small experience of yellow fever (European and native)

and of blackwater fever (European and West Indian negro) I should say that the occasions on which the differential diagnosis between the two diseases comes into question must be rare.

VIII. *Conditions as regards* Stegomyia *Breeding at Warri, especially near residence of and places frequented by the patients*

I inspected a large proportion of the compounds of European officials, native officials, and the general native population, and found them very free from breeding places.

This was also the case in regard to the premises of the mercantile firms, all of which I inspected. Only once did I find larvae in Warri during my inquiry: in one of the trader's compounds on the river bank. They were in the zinc lining of a packing-case that was in use as a receptacle for rubbish.

I inspected sixty-three native dwellings; eleven canoes (not in use); thirty-three water-tanks (in five the gauze was defective); twelve rain gutters; and eleven receptacles for water, such as metal pots, barrels, &c., all taken at random. There were no larvae in any of them. The wells were covered in with one exception, and in this also I failed to find larvae.

There are two villages of moderate size within approximately half a-mile of Warri. I inspected thirty-six of the houses and found larvae in none, in spite of the fact that some water pots raised on wooden tripods in the streets in connexion with fetish worship were swarming with them. These villages are subject to frequent visits by the Sanitary Inspector.

The water supply in Warri for both Europeans (rain-water tanks) and natives (mainly well-water) is, I am informed, adequate, so that there is no necessity for undue economy and protracted storage.

The occurrence of cases of yellow fever would naturally have the effect of greatly stimulating anti-mosquito measures, so that the conditions as I found them some time afterwards probably afford no adequate indication of the state of affairs at the time. I therefore quote the following remarks from a report made in June by the Acting Sanitary Officer:—

'Distribution of *Stegomyia*. They are found more or less

all over the station, but were undoubtedly very much more numerous along the river front in the European traders' compounds than anywhere else. In some of these, *Stegomyia* larvae were found in large numbers in roof gutters, packing-cases, barrels, tins, &c., and * * * 's compound had by far the largest number of breeding places. There was a large collection of empty packing-cases piled up behind * * * 's shop, and the rains had caused the wood to swell so much that the lower tiers were capable of containing six or more inches of water. *Stegomyia* larvae were found in these in large numbers.

'Two or three days after the removal of this breeding place, the shop, which had been infested with mosquitoes, was comparatively free from them. In the Government Rest House, which is situate next to * * * 's compound and to leeward of it, there were also many mosquitoes, with a fair number of *Stegomyia* amongst them, which had doubtless come from Messrs. * * * 's compound.*

'The compounds of the European officials, native clerks, and general native population were remarkably free from breeding places. In the pond and numerous water-holes on the golf course there were enormous numbers of mosquito-larvae; considerable numbers were collected and hatched out but none proved to be *Stegomyia*. Those hatched out were species of *Culex* and *Pyretophorus*.'†

I was informed by the Agent of a trading company that the number of mosquitoes, especially during the first half of the year, appeared to be much in excess of previous experience.

On inspecting their premises I observed a number of canoes (eleven) moored at their wharf (see Plan I). These canoes were laden for the most part with native food-stuffs. I was informed that there is a constant succession of craft which make this wharf

* This Rest House has since been rendered mosquito-proof.—E.J.W.

† In view of the fact that Dr. Laurie, the Junior Sanitary Officer, had found *Stegomyia* breeding in pools at Forcados—Section II—I carefully investigated the possibility of similar conditions existing at Warri. I failed, however, to find larvae in any pools, or in swamp near the town. The pools mentioned above by the Acting Sanitary Officer as existing on the golf course had dried up at the time of my visit.—E.J.W.

their stopping place. They come from widely separated parts of the Niger Delta, and frequently remain alongside overnight. I was unable to discover any larvae in the water which they nearly all contained to a greater or less extent, probably because canoes in use have frequently to be baled out. (In canoes which are not in use larvae may often be found.) The presence of infected natives in such canoes would, however, constitute a perpetual danger to the European inhabitants of the firm's compound.

The firm's agent informed me that canoes from Burutu (*vide* Section II) usually go to Ogbe Ijoh (New Warri) and do not stop at their wharf, but that natives disembark from the bi-weekly launch from Forcados and Burutu opposite their premises, which often remains moored to the wharf until the following day. The facilities, therefore, for the transport of infection direct from Burutu and Forcados, where cases in natives were occurring at the time of the Warri outbreak (Section II) were considerable. It will be seen also (Section II, paragraphs VI and VII) that launches and steamers which moor alongside the wharves may play no small part in the reinforcement of the supply of stegomyia mosquitoes in Warri.

The following are the mosquito indices (all varieties) for the years 1912 and 1913, based on the observations of Native Sanitary Inspectors:—

	1912.	1913.
Quarter ending 31st March... ...	0·2	0·23
,, ,, 30th June	0·48	0·51
,, ,, 30th September ...	0·45	0·36
,, ,, 31st December ...	0·23	

Anti-mosquito work.—Roof and gutters are cleaned, drains and pools oiled, houses and compounds inspected and general anti-mosquito work performed according to a definite routine by a staff of four Sanitary Inspectors, two headmen, and thirty-four labourers. This staff is under the direct control of the Medical Officer, and also attends to general sanitary work.

Convictions under the Mosquito Ordinance.—From January to June, 1913, thirty-one convictions were obtained, the total in fines imposed amounting to £11 10s. 0d.

IX. *Movements of Population suggesting possible transmission of Virus*

See Section II, paragraph VII.

In addition to movements of population indicated in Section II there is a large canoe traffic between Warri and various parts of the Niger Delta.

X. *Conclusion*

The infection of the first patient attacked, case L. 26, appears to be definitely associated with the large number of mosquitoes present in the store in which he worked in the evening mentioned in the introductory paragraph to this section. He may have become infected either while at work in this store or on the occasion when he slept on his verandah without a mosquito net.

There had been no suspicious European cases in Warri previously, and the two native cases quoted in paragraph V had occurred fourteen months earlier.

It will be seen (Section II) that no suspicious cases of fever had occurred at this time in Europeans at Forcados or Burutu, the stations with which Warri is most largely in communication.

I took occasion also to visit and examine the records at the towns in the surrounding country where Medical Officers are stationed, namely:—Sapele, Agbor, Benin, Onitsha, and Aboh. The Medical Officers at these places attend Europeans in their respective districts, and cases of illness are recorded in the hospital books. No cases were recorded as suspicious at any of these stations, but at Sapele a death (European) of an undetermined nature had occurred on a steamer in January, 1913 (Section III, Group B, Case 6). No connexion can, however, be traced between this and the Warri cases.

I carefully examined the available notes of blackwater fever cases at the above stations, but there is no reason to suppose that any confusion had arisen in the differential diagnosis of this disease and yellow fever. Cases of blackwater fever occurred as follows:—

	1911.	1912.	1913. (January to October)
Onitsha	—	2	1
Aboh	—	—	—
Benin	1	1	—
Sapele	4	3	1
Agbor	—	—	—

Attention should here also be drawn to a case at Silooko on the Sapele-Lagos mail-launch route (see under Case 8, Group B, Section III), and to the cases that had occurred on various ocean-going steamers (Section III), two of which had called at Warri. There is, however, no apparent connexion between these cases and the Warri outbreak. It may thus be concluded with some probability that the first patient did not receive his infection from a European source. On the other hand, the facilities for conveyance of *Stegomyia* to the premises of the firm in question by water transport are, as has been shown, considerable, and there is always the possibility of the infection having been so conveyed by a mosquito infected from some distant European case which had escaped recognition. This possibility becomes the greater if it be conceded that *Stegomyia* may transmit their infectivity to the first generation. But the likelihood of the infection having been acquired from a native source, particularly in view of the cases which were occurring at that time at Burutu and Forcados (Section II) appears to outweigh these possibilities. The slight ambulatory character which the disease may assume in natives, as illustrated in many of the Burutu, Lagos, and Forcados cases, and the significant fact that the patients who applied for treatment were also exclusively males, makes it practically certain that there are numerous instances in which patients do not seek hospital advice and constitute a source of grave danger to the European community. This danger must be considerable in the absence of European segregation and is emphasized in the case of mercantile firms who shelter numerous natives within their compounds (about forty in one firm's enclosure). Any increase of *Stegomyia*, the possibility of which under existing conditions must be ever present, would then, in the proximity of native reservoirs of infection,

become a serious menace. The practical result of these inferences would appear to be illustrated in the cases under consideration. As shown in the introduction to this section, the second patient's illness was almost certainly secondary to that of the first.

Section II

Introduction.—This section deals essentially with certain cases of fever among natives which occurred during the first eleven months of 1913* in the ports of Forcados and Burutu.

Reference is also made to a case (native) in 1911, and to four cases (Europeans) in 1909.

The European cases were reported by the Medical Officer, Forcados, to the Principal Medical Officer as possible instances of seven-day fever. He also reported as 'unclassified fever' the native case of 1911, and the greater number of the 1913 native cases, but on examining the Forcados records I thought it desirable to include some further cases which present features of interest.

The notes of all the native patients are included in paragraph 5, and, in order to secure a certain degree of uniformity, they have been edited to some extent.

I have included in this section a synopsis and tabular statement of the cases, as they constitute a well-defined group.

I. *General Description of Forcados District and the Ports of Forcados and Burutu*

(*a*) *Forcados District*

Boundaries:—

On the north by Sapele District.
On the east by Warri District.
On the south by Brass District.
On the west by the sea.

Area:—

925 square miles.

* With the exception of one case, which occurred at the end of November at Forcados, and is not included here.

Total population, 37,657.
Comprised of:—
Natives of West Africa, 37,171.
Europeans, 480 (396 of these were on ocean boats).
Asiatics, 1.
Other non-West Africans, 5.
Average density of native population per square mile, 40·18.
} Census, 1911.

(*b*) *Forcados Port*

The port is situated within the mouth of the Forcados river (one of the estuaries of the Niger), on its left bank, about five miles from the sea.

It is one of the principal places of call for ships in Southern Nigeria. The draught on the bar is sufficient at high tide to enable ocean liners of moderate size to enter the river. It stands upon a flat area of partially reclaimed swamp, which is drained by intersecting shallow tidal ditches. In the wet season the greater part of this area is water-logged, and many of the houses, both European and native, are built upon piles.

The paths are artificially raised.

Encroachment from the water is prevented by a concrete wall.

Area:—
Approximately 200 acres.
Total population, 3,189.
Comprised of:—
Europeans, 42 (officials 25; non-officials, 17).
Natives and other coloured races, 3,147.
} Census, 1911.

(There is also a variable floating population—upon steamers in the river—not included in the above figures).

The native population consists mainly of Government officials and employees, and the employees of mercantile and shipping firms. There are two native villages in the vicinity, the nearest of which is approximately one furlong from a European residence.

There is no declared European reservation; indeed, several houses occupied by European officials were at the time of my investi-

gation—and some still remain—in close proximity to native dwellings. Thus certain sheds (since abandoned) occupied by native boatmen with their wives and children were situated at a distance of only 120 yards from the District Commissioner's house, while they were within 90 yards of the Senior Marine Officer's house and the quarters of some other European officials and practically adjoined the Rest House, which is used as permanent quarters.

As is to be expected, under these circumstances, even less attention is paid to the question of European segregation among mercantile firms. Thus in one compound inspected by me there were housed 151 natives (36 Kroo boys and 115 natives of Nigeria) within a relatively short distance of the offices and living rooms of the European staff.

(*c*) *Burutu Port*

The port is situated about five miles to the east of Forcados on the same bank of the river. The area of ground which it occupies is, for the most part, sand-bank, the remainder being reclaimed swamp, which is similarly drained and protected to Forcados.

The port is an important place of call for ocean liners, which here, in contra-distinction to Forcados, moor alongside the wharves. At the latter place they, for the most part, anchor in the river.

Area :—
Approximately 45 acres.
Total population, 1,514.
Comprised of :—
Europeans, 20 (officials, 3; non-officials, 17).
Natives and other coloured races, 1,494.
} Census, 1911.

(There is also a variable floating population—upon steamers in the river—not included in the above figures).

The native population consists mainly of Government officials and employees, and the employees of the Niger Company. There is no European reservation; indeed, the quarters of the Marine Officers are only approximately 100 yards from the house occupied

by a native official and from a shed where native passengers by river-boat are allowed to pass the night when necessary.

In both Forcados and Burutu, the water supply is obtained in the case of Europeans from screened rain-water tanks, in the case of natives also to a great extent from wells and water-holes.

II. *Rainfall and Temperature*

In Appendix IV will be found a record of the monthly rainfall, together with maximum and minimum shade temperatures during 1911, 1912, and the first eight months of 1913.

It will be seen that (as the weather conditions are practically identical in Forcados and Burutu) these conditions do not appear to have exercised any special influence on the incidence of the cases recorded for 1913, since those at Burutu occurred between January and July only, whilst those at Forcados occurred exclusively from April onwards. Cases which did not seek the Medical Officer's advice *may*, of course, have continued to occur at Burutu after July, just as they *may* have occurred at Forcados before April. I would suggest that epidemics of disease connected with domestic mosquitoes may probably be more closely allied to conditions of water-storage than to seasonal incidence and that the influence of the latter is felt indirectly through its effect upon the former.

III. *Any Recent (Suspicious) High Mortality amongst Natives at Forcados and Burutu, especially Native Children*

The Medical Officer told me that no exceptional mortality had come under his notice. The District Commissioner informed me further that registration of deaths is quite unreliable, the natives being very reluctant to give information, so that practically the only cases registered are such as come directly under official notice (e.g., the Coroner's inquest). My interrogation of the representative Chiefs of the two ports was with an entirely negative result.

IV. *Number of Europeans in Forcados and Burutu, and Suspicious Cases of Fever among them within the last Twelve Months*

The number of Europeans resident in Forcados and Burutu at the time of my investigation was 56. There were no Syrians living at either port. The number of cases of malaria in Europeans

treated in 1911, 1912 and 1913 (to the end of November) was respectively 29, 53 and 38. There were no cases of haemoglobinuric fever during these years.

I examined all available records and found that there had been no suspicious cases of illness in Europeans since 1909. I do not here take into account certain cases of fever which occurred on ocean-going steamers, some of which were actually at Forcados at the time, whilst others had touched there. These are discussed in Section III.

Out of the 56 residents, I found that three had lived in regions where yellow fever is endemic before coming to West Africa. I was informed by one of these that he had contracted the disease about seventeen years ago at Santos (Brazil), but he was unable to recollect any details of the illness.

In view of a perhaps previously acquired immunity, I have collected the figures which, for the sake of clearness, are appended in tabular form (Table No. 1), from which it will be seen that, provided prolonged residence in an endemic zone, without long intermissions in regions non-endemic, confers immunity (as having passed through an attack of the disease is said to do), then the three residents mentioned in the table must be insusceptible. From the same point of view, a table (Table No. 2) is appended, of the remaining 53 residents. The following are copies of the notes and charts of four cases of fever in Europeans which occurred in Forcados in 1909. Nos. 1, 2 and 3 were reported to the Principal Medical Officer as possible cases of seven-day fever and I have included them all here, not only because they present features of great interest, but also because seven-day fever forms one of the subjects of inquiry of the Yellow Fever Commission.

Dr. Bailey, Medical Officer at Forcados, in the prefatory note to his report on some cases of unclassified fever (1913) says:—

> 'The three cases, Nos. 1, 2 and 3, I reported at the time and suggested that they were cases of seven-day fever as described by Leonard Rogers in his "Indian Fevers."
>
> 'The notes were incomplete, but I got enough to establish:
>
> '*In all*: The temperature chart with double rise.
>
> '*In two cases*: Violent loin pain and slow pulse (as far as

it went). A prostration too great for the temperature. A recovery free from relapses.

'One case—No. 2—had a profuse rash. Case 4, which ended in death, could not have been seven-day, even if the others were, as Rogers says no fatal case has been known. His temperature rose to 105° on third day, remitted a little and then rose to 105° again on the fifth day. Urine was unfortunately not examined. Death occurred on the sixth day after most violent mania and convulsions (at that time one only considered malaria and sun). This case is given because it must bear on the other three, although I hope it is not the same.'

I would here remark that in Cases 2 and 3, in which the urine was examined, there was no albuminuria on the third day of the disease and it was not subsequently tested for. Albuminuria, in cases of yellow fever, may, of course, occur later.

TABLE NO. 1

Number	Number of years resident in an endemic area other than West Africa	Period between residence in an endemic area and first coming to West Africa. (Interval of residence in a non-endemic area)	Number of months in West Africa since last in Europe	Number of months in Forcados or Burutu since last in Europe	Number of months in other parts of West Africa since last in Europe	Number of months in West Africa (not including leave) since first coming to West Africa
1. Government official	28	2¼ months	12	12	—	119
2. ,, ,,	27	3 ,,	4	4	—	95
3. ,, ,,	3	5 ,,	5	5	—	157

NOTE.—No. 3 is said to have suffered from yellow fever about seventeen years ago at Santos (Brazil).

TABLE NO. 2

Number	Number of months in West Africa since last in Europe	Number of months in Forcados or Burutu since last in Europe	Number of months in other parts of West Africa since last in Europe	Total number of months resident in West Africa since first coming to West Africa (not including leave)
1. Government official...	5	5	—	123
2. ,, ,, ...	9	3	6	24
3. ,, ,, ...	4	4	—	101
4. ,, ,, ...	1	1	—	27
5. ,, ,, ...	9	3	6	81
6. ,, ,, ...	5	2	3	36
7. ,, ,, ...	5	5	—	5
8. ,, ,, ...	3	3	—	27
9. ,, ,, ...	6	6	—	32
10. ,, ,, ...	8	4	4	68
11. ,, ,, ...	8	2	6	20
12. ,, ,, ...	6	6	—	42
13. ,, ,, ...	1 week	1 week	—	36
14. ,, ,, ...	3	3	—	3
15. ,, ,, ...	11	11	—	103
16. ,, ,, ...	2 weeks	2 weeks	—	39
17. ,, ,, ...	6	2	4	82
18. ,, ,, ...	11½	11½	—	85½
19. Non-official	8	8	—	48
20. ,, ...	10	10	—	35
21. ,, ...	4	4	—	42
22. ,, ...	7	7	—	62
23. ,, ...	11	10	1	62
24. ,, ...	10	10	—	59
25. ,, ...	2 weeks	2 weeks	—	210
26. ,, ...	6	6	—	51
27. ,, ...	9	9	—	21
28. ,, ...	2	2	—	2
29. ,, ...	5	5	—	64
30. ,, ...	4	4	—	56
31. ,, ...	10	6	4	10
32. ,, ...	17	13	4	42
33. ,, ...	26	6	20	26
34. ,, ...	15	15	—	360
35. ,, ...	2	2	—	24
36. ,, ...	2	2	—	2
37. ,, ...	13	13	—	48
38. ,, ...	12	12	—	33
39. ,, ...	13	13	—	192
40. ,, ...	13	13	—	144
41. ,, ...	2	2	—	20
42. ,, ...	2	2	—	2
43. ,, ...	13	13	—	84
44. ,, ...	14	14	—	38
45. ,, ...	16	16	—	16
46. ,, ...	7	7	—	53
47. ,, ...	15	15	—	45
48. ,, ...	17	17	—	17
49. ,, ...	8	8	—	92
50. ,, ...	1	1	—	21
51. ,, ...	12	12	—	51
52. ,, ...	4½	4½	—	64½
53. ,, ...	2	1 week	1¾	91

Case 1. L. 7†

Copy of Notes by the Medical Officer, Forcados

Race : European.
Age : —
Occupation : Foreman.
Date of illness : October, 1909.

This was a case of 'fever' returned as malaria, which occurred one month before cases 2 and 3 and before the death, at which both men assisted. When making a report on them, I turned up also this chart of a case which had worried me, because quinine, although absorbed, had no effect at all on the disease.

It shows very well the double rise of temperature, and I consider it to have been a case of the same kind.

The pulse was not recorded in this case, as I was thinking of nothing but malaria.

Case 2. L. 10†

Copy of Notes by the Medical Officer, Forcados

Race : European.
Age : —
Occupation : Foreman.
Date of onset : 22nd November, 1909.
Date of recovery : 29th November, 1909.

23rd November.—Seen to be ill in the evening. Illness stated to have begun the day before. Patient had just assisted at death of a brother foreman from a disease characterized by continuous high temperature and mania at last.

Patient was too ill for his temperature—great prostration—dirty tongue—violent pain in the back.

A vivid rash, like rubella, appeared on 23rd, becoming faintly papular (never vesicular) on wrist and ankles—forehead and neck deeply flushed—face clear.

No catarrhal symptoms—no glandular enlargement.

Second rise of temperature on fifth day, with return of symptoms in less degree. Slight bilious vomiting occurred once. No jaundice. Quinine was given on second day, then reduced to 5 grs. daily, as case obviously not malarial.

Urine on third day : No albumen.

Pulse was 55 with normal temperature on seventh day, unfortunately not counted before.

In view of :—

1. The fact that case was obviously not malarial ;
2. The double rise of temperature ;
3. The duration ;
4. The violent loin pain ;
5. The slow pulse ;

I suggested in reporting the case that it much resembled cases described as seven-day fever in India by Rogers and others.

It is a great pity, of course, that there is not a better record of the pulse. Second hands do not always abound in outstation out-patient practice, and I did not consider the possible great importance of a pulse count till late in the case.

The rash persisted for some weeks and left stains.

Convalescence was slow but sure.

No relapses or joint or bone pains.

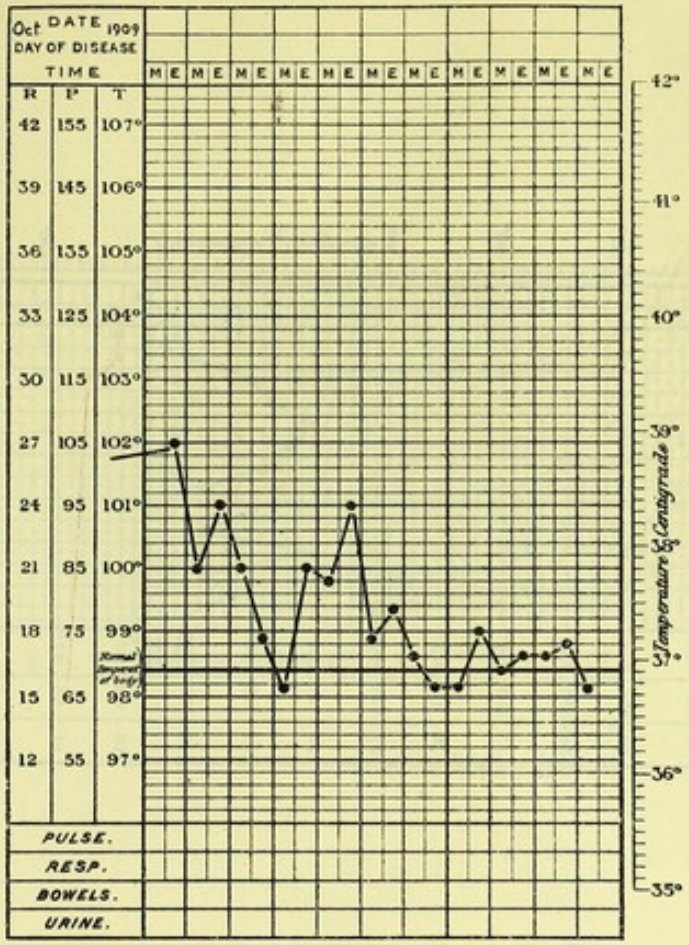


Chart 13. Case 1

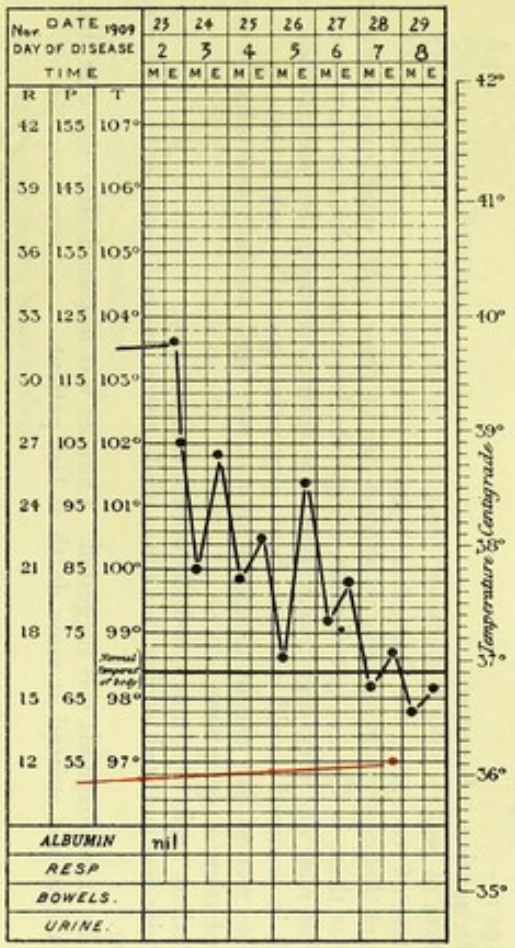


Chart 14. Case 2

Case 3. L. 9†

Copy of Notes by the Medical Officer, Forcados

Race : European.
Age : —
Occupation : Foreman.
Date of onset : 23rd November, 1909.
Date of recovery : 1st December, 1909.

24th November.—First seen on second day of fever. All symptoms were the same as those in Case 2, but slighter, except the loin pain, which was very severe.

The rash was very slight, and, although distinct enough, the few patches in which it occurred would not have been seen unless specially looked for.

The second day rise of temperature was very well marked, and with it the exacerbation of symptoms.

Patient again was much too ill for his temperature.

Pulse was counted earlier this time, while there was still some fever, and was slower.

The same diagnosis was suggested. Quinine was not used after the first day.

Patient had assisted at same death as last patient.

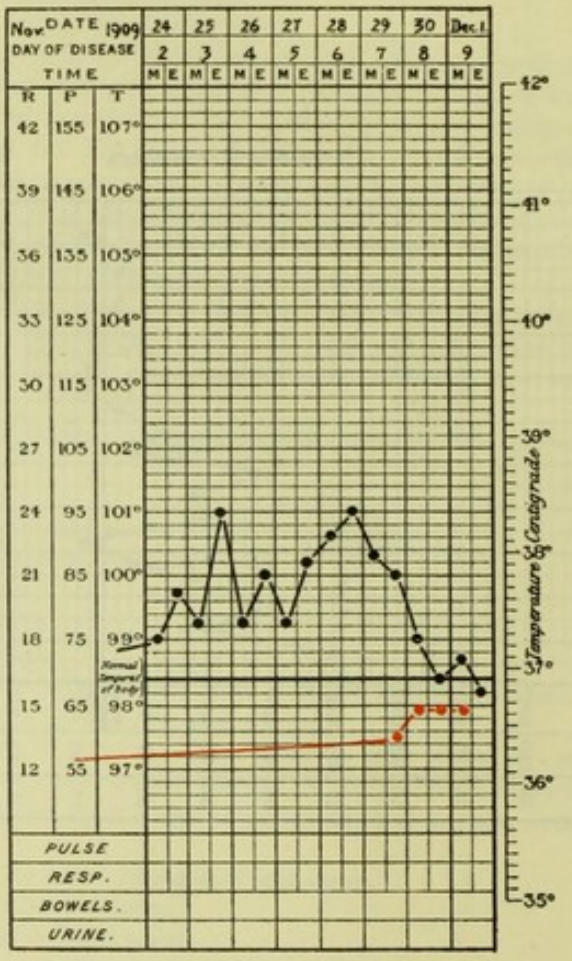


Chart 15

Case 4. L. 8†

Copy of Notes by the Medical Officer, Forcados

Race : European.
Age : —
Occupation : Foreman.
Date of onset : 16th November, 1909.
Date of death : 21st November, 1909.

16th November.—Felt seedy, but worked apparently with temperature till 18th November, when fever reached 105° in the evening.

Temperature dropped to 103°-104° next day, and rose on 20th November to 105° again.

On the night of the 20th there was merry delirium—giving way to ice as temperature fell to nearly 100°. Then, in morning of 21st, violent mania followed by convulsions supervened and patient died.

Urine : Not examined.
Chief trouble : Headache.
Two slight bilious vomits.
No haemorrhages.
Returned as a death from malaria.
No post-mortem.

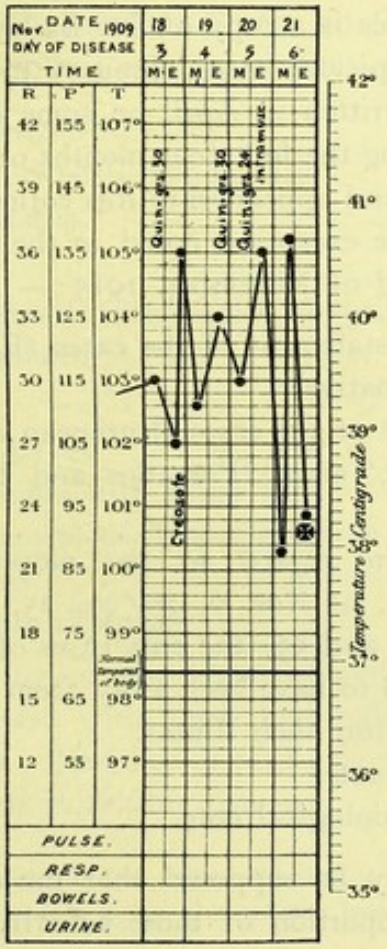


Chart 16.

V. *Prevalence at Forcados and Burutu of suspicious cases of fever among Natives*

I examined all the hospital and post-mortem records of these stations.

In 1911, 1912 and 1913 (to the end of November), 213, 368 and 388 cases respectively of malarial fever in natives were treated. The records of these cases present no anomalous features with the exception of one in 1911.

From the third week in January, 1913, up to the time of my inquiry (November) a number of suspicious cases had occurred. These are not included in the 388 cases diagnosed as malaria, treated during that period. The following are copies of the notes and charts of these suspicious cases, including the one of 1911. (Nos. 1, 2, 3 and 4—the European cases—have already been dealt with in paragraph IV.)

Preceding the notes is a copy of Dr. Bailey's cover to his half-yearly return of suspicious cases, January to June, 1913, and a copy of his report written in April on some cases of unclassified fever at Burutu during the first four months of 1913.

I have compiled and appended to this collection of cases, which is complete, with the exception noted in the introduction to this section, up to the end of November, 1913:—

(i) A tabular statement of the cases (European—paragraph IV—and native).
(ii) A synopsis of the cases (European and native).
(iii) Two 'spot' maps (Forcados and Burutu) of the 1913 cases.
(iv) A note in regard to the movements, previous to admission, of Nos. 6, 20, 21, 25, 28, 31, 35, 39, 46, 47, 48, 52 and 53—the only cases of the 1913 series who are known to have been away from Forcados or Burutu shortly before their illness.
(v) A clinical note.
(vi) An epidemiological note.

It may reasonably be supposed that the cases here described represent only a proportion of those actually sick, and, in this

connexion, it is significant that with one exception all the patients were males and none were children below the age of twelve.

In considering them I would draw attention to the fact that the chart records were made, for the most part, by a native dispenser or dresser. Experience has shown that the records of temperature, albuminuria and bowel actions may be accepted as correct, those of pulse-readings and reaction of urine as probably correct (it will be seen, however, that some of the pulse-readings are difficult of acceptance), those of the total quantity of urine excreted and of its specific gravity as mostly incorrect. These latter are, therefore, not referred to in the synopsis. The records of respirations are very unreliable and I have accordingly omitted them from the charts, except in two cases—Nos. 14 and 15: the patients were suffering from pneumonia and the records are given for what they may be worth.

Copy of Dr. J. C. M. Bailey's Cover to Half-Yearly Return of Suspicious Cases: January—June, 1913

All were characterized by:—

1. Being obviously non-malarial.
2. Albuminuria.*

Many had:—

1. Characteristic double rise of temperature.
2. Slow pulse.

Some had:—

1. Injected eyes.
2. Red tongue with white fur.
3. Enlargement of liver and spleen.
4. Deafness.
5. Slow convalescence.

None had vomiting or any apparent abdominal disturbance.† The fatal case classed with them had coffee-ground vomit and malaria post-mortem. Jaundice in slight degrees was not accepted as it is almost the rule in healthy persons.

---

* Cases 26, 37, 38, admitted after June, had no albuminuria.—E.J.W.

† There was vomiting in cases 39, 47, 51, admitted after June.—E.J.W.

Copy of Report by Dr. J. C. M. Bailey, written in April, on some Cases of Unclassed Fever Occurring at Burutu during the First Four Months of 1913.

Since the beginning of this year I have been called on to treat a number of cases of fever, mostly of a pretty severe type, which cannot possibly be passed under any of the usual headings.

All these cases have occurred at Burutu. They can, I think, be divided into two distinct classes—Class A and Class B. There seems to be a tendency to the occurrence of an epidemic of Class B at the present time.

I am returning with Class A a report on a case of fever in a native policeman here in August, 1911, which I then returned as fever undiagnosed and later sent in as a 'suspicious' case on the ground that anything not malarial was suspicious.

Class A consists of two cases (Nos. 6 and 7*): A. (No. 6) admitted 22nd January, and J. (No. 7) admitted 19th February.

Both were characterized by:—

1. Very great prostration.
2. Albuminuria.
3. Very slow convalescence.
4. No parasites.
5. No vomiting or jaundice.

They very much suggested clinically that they were of the same type as case No. 5, August, 1911, attached to them.

It is not easy to be certain about the type of temperature. I know that I caught No. 5 on the second day and I think No. 7 not later than the third, but No. 6 gave a long history and I supposed that he might possibly have been an enteric. I don't think so, but my experience of that disease is not extensive. He was constipated throughout his stay in hospital and took purges regularly. There was no enlarged spleen and no flatus. I have no diagnosis to suggest for these fevers.

Class B consists of the following:—No. 9 admitted 4th March; No. 10 admitted 4th March; No. 11 admitted 4th March; No. 12 admitted 5th April; No. 13 admitted 8th April.

* The cases are numbered by me for convenience of reference.—E.J.W.

All these cases are not malaria.

They are characterized by:—

1. Albuminuria.
2. Slow pulse.
3. An absolutely typical temperature chart seven to nine days' long showing a perfectly clear double rise.

In several there has been:—

4. Injection of the eyes.
5. Thick white fur on dorsum of tongue.
6. Deafness of varying degree.

The blood, where examined, has been negative and in one case—No. 9—where quinine was accidentally given throughout, the disease was absolutely unmodified.* There has in no case been any vomiting or tendency to it.

Some of the cases have been severe and the patient evidently very ill. Others fairly slight, but even then there is considerable apathy noted and only in one case—No. 10—did the patient protest he was well, and he was obviously scared of being in hospital and upset at the milk diet with which I started him.

The deafness is interesting.

I have had a death a day or two ago, which I am returning as from otitis media (Case 8). In this case prolonged and profuse suppuration was apparently the cause of the patient gradually sinking after his temperature, which was very high and irregular for three weeks, had subsided. It has occurred to me that this otitis may have been the result of an attack of the fever I am describing. The patient had albuminuria. No post-mortem.

For the Class B fever I have again no diagnosis to offer. The chart is very like seven-day fever and the slow pulse also, but the loin pain described by Rogers has not been forced on one at any date and what pains do occur are, I think, fairly attributable to the temperature—Class B fever will do for a name for the present.

In none of my unclassified fevers has there been any digestive trouble, *e.g.*, vomiting—*or any haemorrhagic tendency at all.*

---

* Quinine was also given in cases 38, 40, 42, 43, and 50, admitted in October. With these five exceptions also none of the patients received quinine.—E.J.W.

CASE 5. L. 6†

Race : Negro.
Age : —
Sex : Male.
Occupation : Water-policeman.
Date of admission to hospital : 26th August, 1911.
Date of discharge : 4th September, 1911.

A case returned in first return of suspicious fever as a case possibly of yellow fever.

Characterized by :—

Great prostration.
Foul tongue.
Injected conjunctivae.
Cloud of albumen in urine on fourth day—disappearing later.
No vomit.
Liver somewhat enlarged—tender.
No jaundice.
Pulse rate slow for temperature and pulse weak.
No special pain, back or otherwise.
No parasites in blood.

Convalescence was slow, and patient remained weak and apathetic for some considerable time.

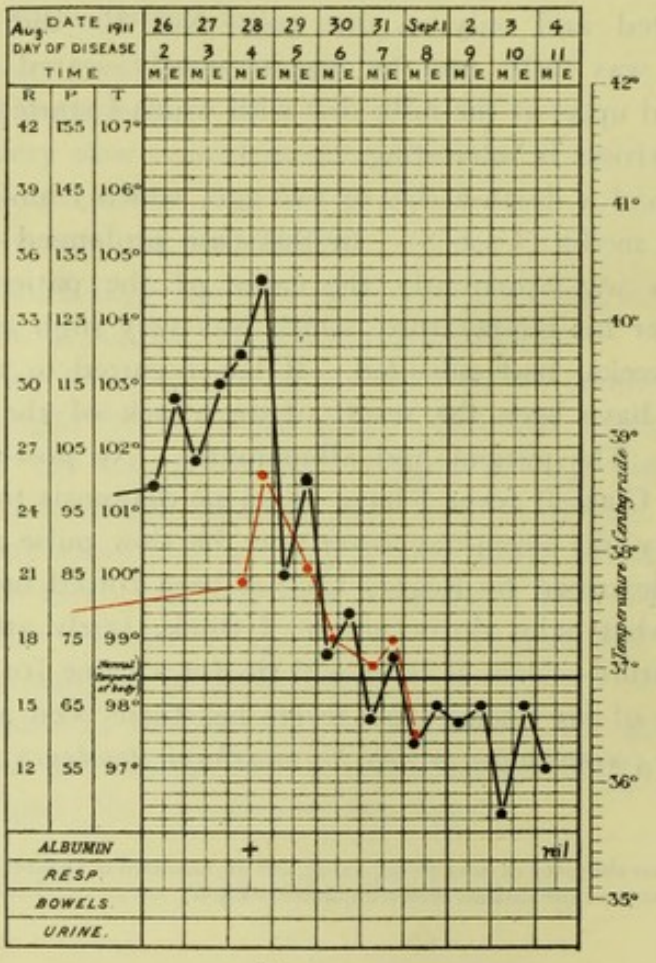


Chart 17.

CASE 6. L. 11†

Race : Negro.
Age : 30.
Sex : Male.
Occupation : Engineer.
Date of admission to hospital : 22nd January, 1913.
Date of discharge : 13th February, 1913.

History.—Of three weeks' fever.

Condition on admission.—Admitted *very prostrate*—wasted. Temperature 105° Fahr. Pulse 120. Eyes—no jaundice. No vomiting. Liver slightly enlarged and tender. Chest, some natural râles. Urine, no albumen ; bilious appearance, but nitric acid test negative. Blood, negative.

Course : 30th January.—Cloud of albumen appeared in urine and remained till 4th February.

27th January.—Patient began complaining bitterly of burning pain in soles of feet. This symptom persisted after discharge. Knee jerks were present.

The fever took a long time to wear out ; finally after nearly three weeks temperature became sub-normal and of moderate excursion and convalescence started.

The case completed showed a fever *not malaria*, characterized by *great prostration*, albumen in urine, no jaundice or vomiting, pulse rate not helpful, no parasites in blood, a slow convalescence with no relapse.

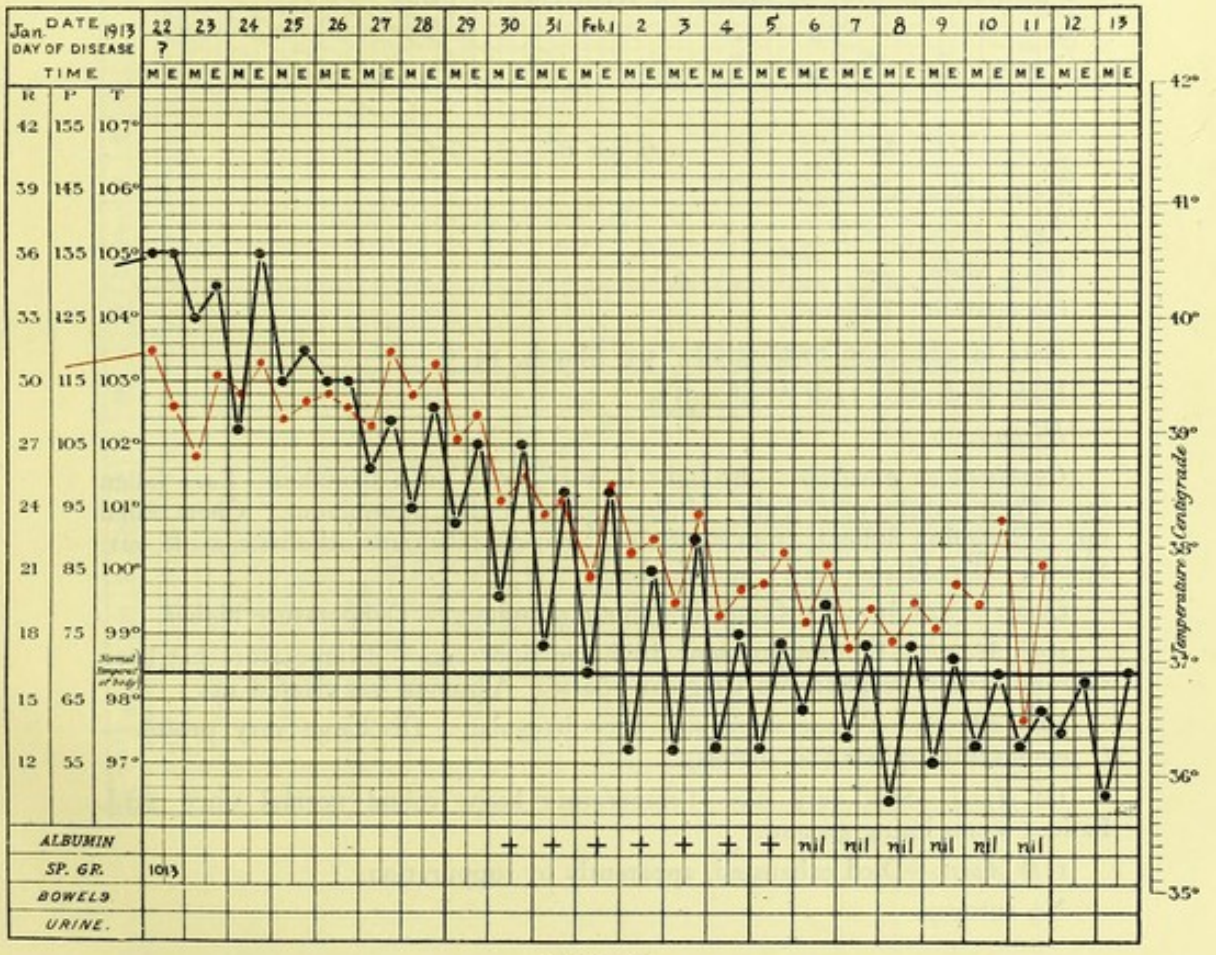


Chart 18.

CASE 7. L. 12†

Race : Negro.

Age : 26.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 19th February, 1913.

Date of discharge : 18th March, 1913.

History.—One week's illness (doubtful).

Condition on admission and course.—Complained chiefly of pain about shoulders and other joints, and was first put on sod. salicyl. Day after admission urine was found thick with albumen. His tongue was furred. No vomiting. No parasites in blood. Prostration was great, in spite of which he managed to escape from isolation and was not recaptured for four days, when fever was obviously on the decline. Temperature became sub-normal and case dragged slowly on till 18th March, when temperature rose to about normal, and patient, still weak and giddy, was discharged.

The case completed showed a fever *not malarial* (treatment : no quinine) characterized by great prostration, foul tongue, albuminous urine, no jaundice or vomiting, pulse rate not helpful, no parasites in the blood, a convalescence slow and painful, but with no relapse or recurrence of pains.

CASE 8

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 3rd March, 1913.

Date of death : 11th April, 1913.

History.—

Condition on admission.—Brought in very seedy on a stretcher. Face fallen in. Temperature, 98·6° Fahr. Pulse, rapid. Urine, albuminous. Chest, filled up. Coughing difficult from weakness. No definite signs otherwise made out. Spleen, enlarged and hard ; not tender.

Course : 4th March.—Condition about the same. Temperature higher.

10th March.—Profuse purulent discharge right ear. Temperature has been running a very peculiar and irregular course. Albumen has cleared up.

20th March.—Temperature still very irregular. Discharge very profuse—(? temperature sphenoidal abscess).

1st April.—Still very ill. Temperature keeps round normal since 23rd. Patient seems losing ground.

11th April.—Died exhausted, apparently by suppuration.

No autopsy.

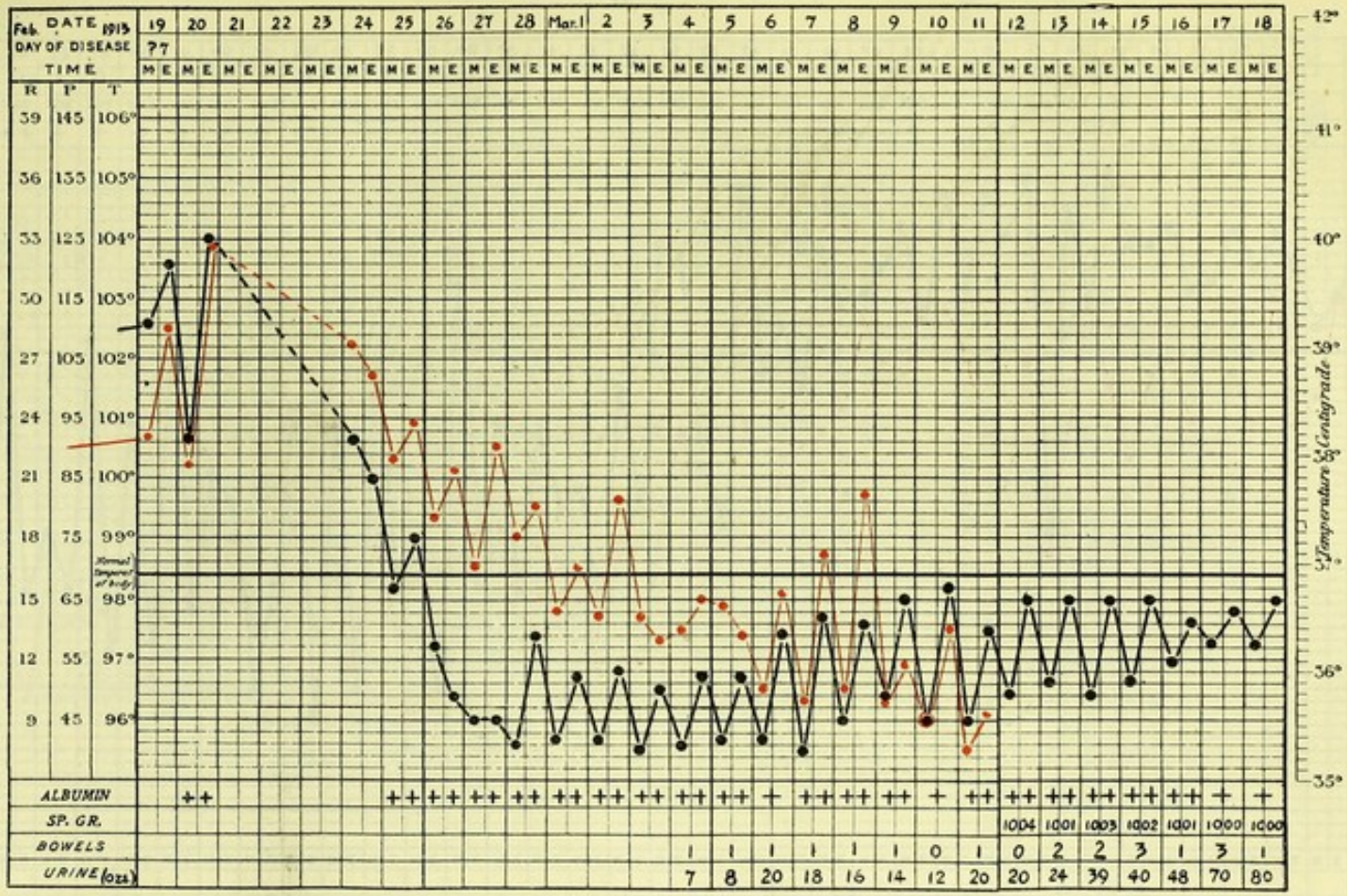


Chart 19. Case 7.

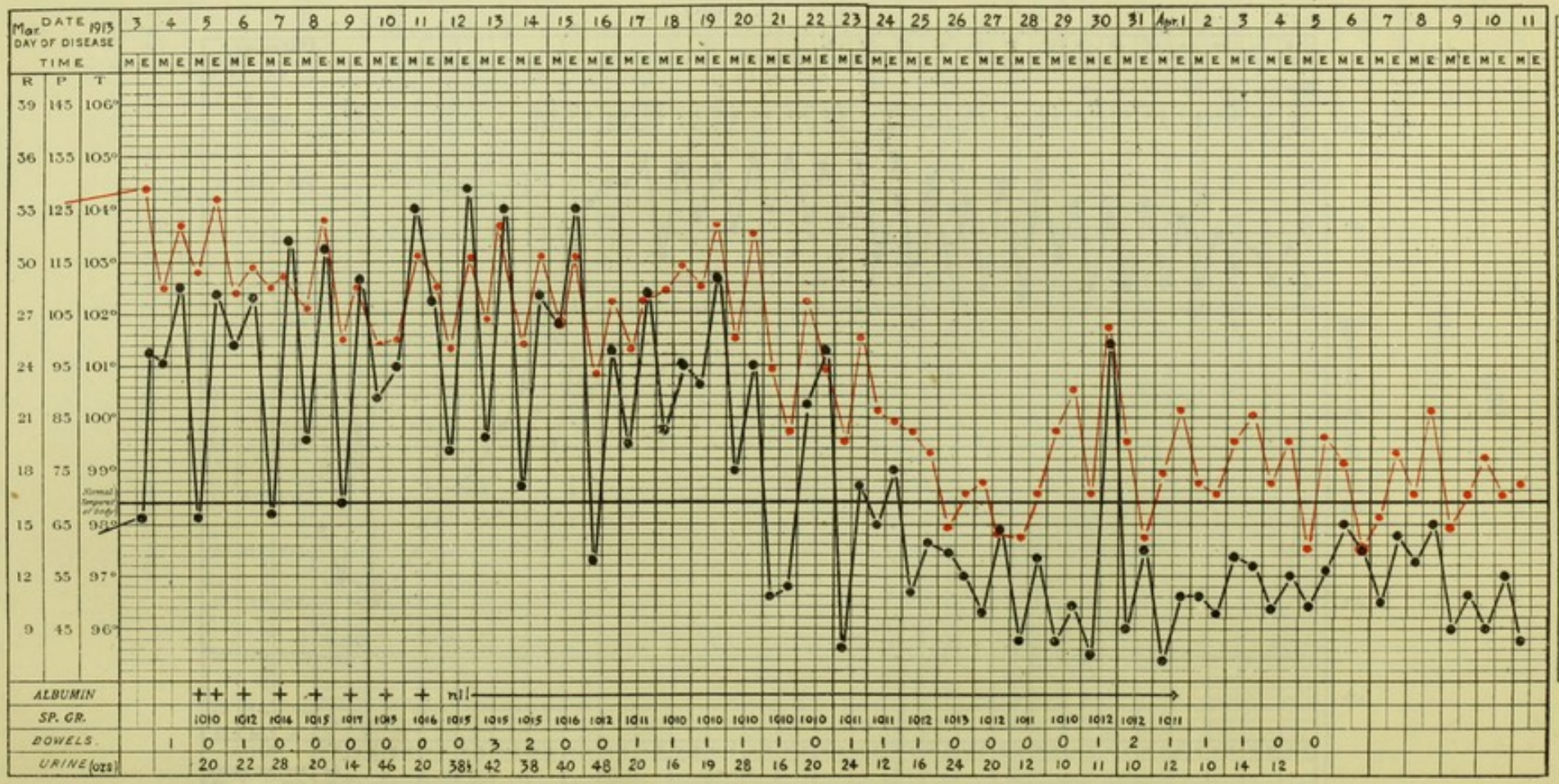


Chart 20. Case 8.

CASE 9. L. 3†

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 5th March, 1913.

Date of discharge : 13th March, 1913.

History.—Fever of one week's duration, with pains all over his body.

Condition on admission.—Temperature, 102·4° Fahr. Pulse, 110. Eyes, not injected. Tongue, pretty clean. Complained of pains all over neck, back and arms. Bowels open daily. No vomiting. Abdomen, spleen just palpable on deep inspiration. Blood, negative. Urine, slight cloud of albumen.

Case completed showed a fever not malarial. Albuminuria. Temperature chart of absolutely characteristic type—double rise. Slow pulse.

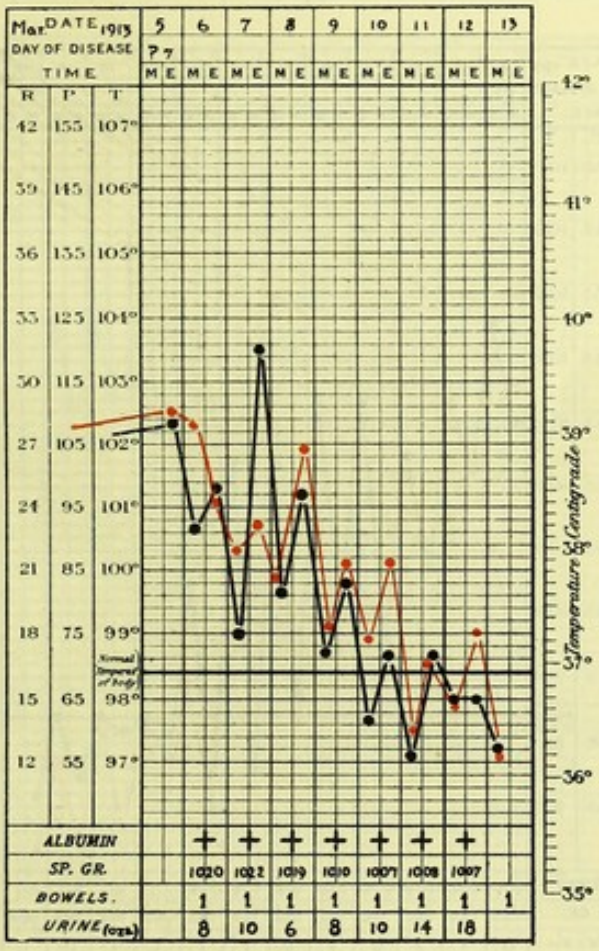


Chart 21.

CASE 10. L. 2†

Race: Negro.

Age: 29.

Sex: Male.

Occupation: Labourer.

Date of admission to hospital: 4th March, 1913.

Date of discharge: 15th March, 1913.

History.—Of seven days' illness.

Condition on admission.—Temperature 103° Fahr. Pulse, 82. Eyes, slight injection; no jaundice. Tongue, coated. Breath, foul. No vomiting. Chest and abdomen, negative. Urine, thick albumen. Blood negative.

Later developed deafness (no quinine given). Case completed showed a fever not malarial, of a fairly severe type, although patient, who was scared of hospital, constantly said he was fit to go.

Albuminuria. Injected eyes. Tongue coated. Deafness. Temperature chart of an absolutely characteristic type, double rise. Slow pulse.

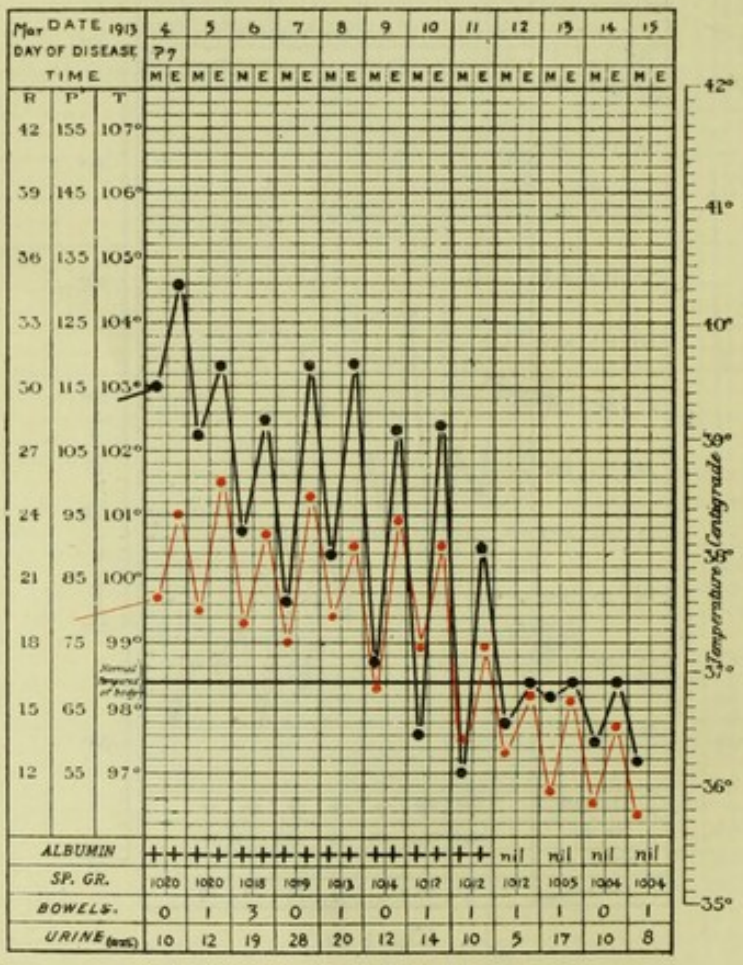


Chart 22

CASE 11. L. 1†

Race : Negro.

Age : 26.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 4th March, 1913.

Date of discharge : 18th March, 1913.

History.—Three days' illness.

Condition on admission.—Temperature, 100·6° Fahr. Pulse, 92. Eyes injected. Tongue, coated on top ; red at tips and edges. Chest, a few bronchitic signs ; respirations hurried, about 45. Abdomen, negative. Urine, thick albumen. Blood, negative. Later, deafness.

Night of 12th, a renal crisis—70 ozs. urine passed.

Case completed showed a fever, not malarial, of a severe type with albuminuria. Injected eyes. Sharp red tongue coated on dorsum. Deafness. Temperature chart characteristic, double rise. Slow pulse.

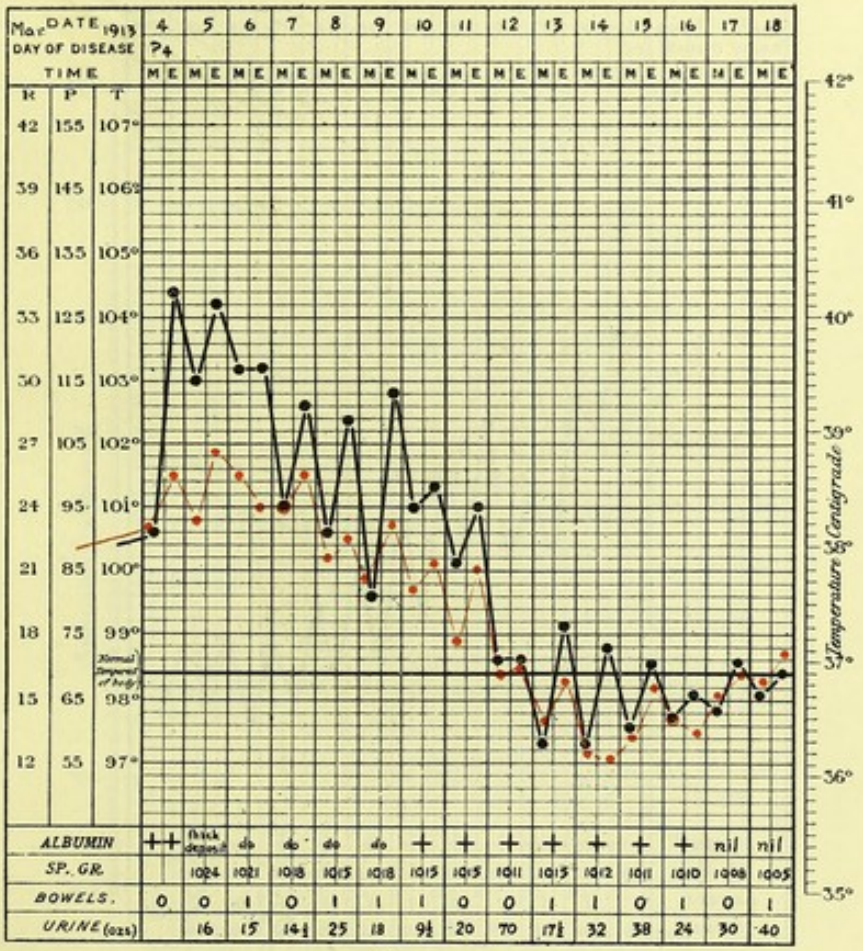


Chart 23

CASE 12. L. 4†

Race : Negro.

Age : 18.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 5th April, 1913.

Date of discharge : 16th April, 1913.

History.—Five days' illness before admission.

Condition on admission.—Temperature, 103·5° Fahr. Pulse, 122. Eyes, slightly injected. Tongue, bright red with white fur on dorsum. Abdomen : spleen, two fingers below ribs ; liver, two fingers below ribs ; tender. Urine, thick albumen.

Deafness complained of on 10th, but slight.

Case completed shows a fever not malarial, characterized by : Albuminuria. A typical temperature chart. Injected eyes. Red tongue with white fur. Deafness.

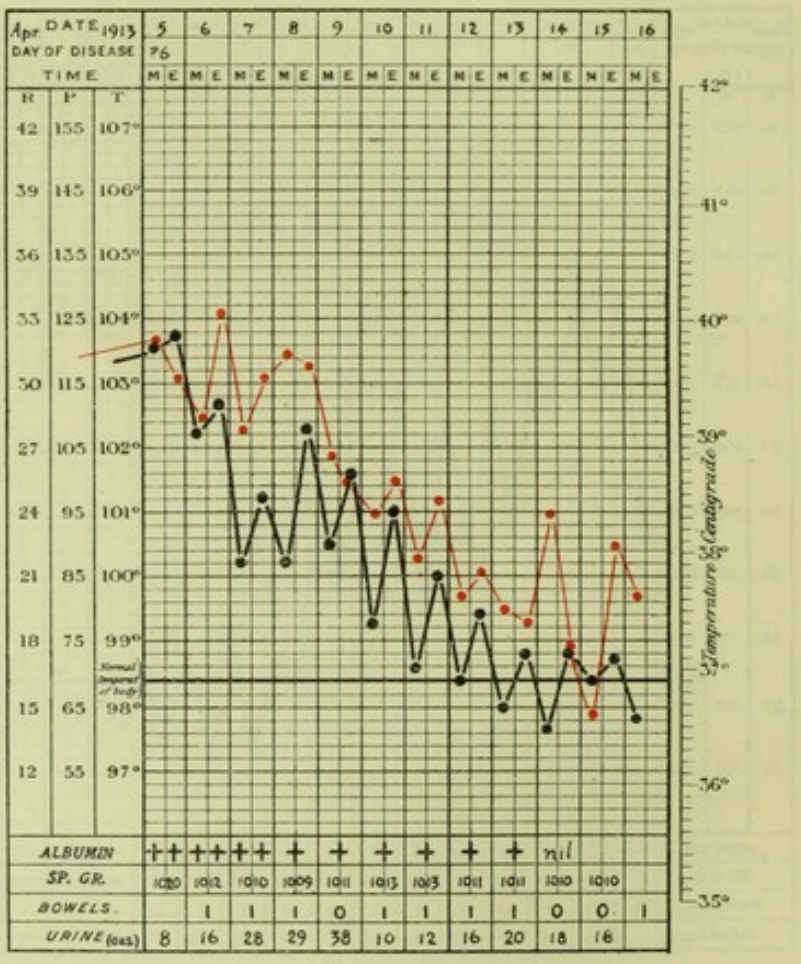


Chart 24

CASE 13. *Commission number not obtainable*

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital ; 7th April, 1913.

Date of discharge : 16th April, 1913.

History.—One week's illness—' fever.'

Condition on admission.—Temperature, 101·4° Fahr. Pulse, 100. Eyes jaundiced. Urine, much albumen. Chest, crepitations at right apex in front and in axilla.

Course : 10th April.—Temperature sub-normal all day. Albumen has cleared up. Jaundice of conjunctivae marked. Pneumonic crepitations still heard over front of right chest and in axilla, with slight difference of note on percussion. Patient somewhat knocked out by illness.

13th April.—Remains in apathetic state, but is doing well.

16th April.—Discharged well.

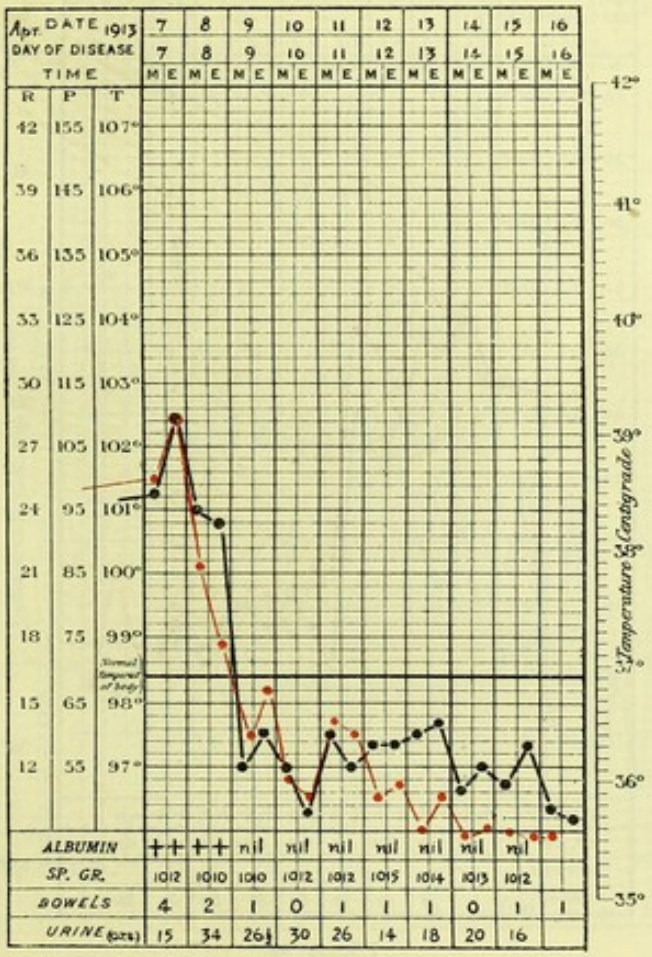


Chart 25

Case 14

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 7th April, 1913.

Date of discharge : 16th April, 1913.

History :—

Condition on admission.—Temperature, 102·8° Fahr. Pulse, 110. Pneumonic signs right apex in front. Inclined to delirium. Urine, albuminous.

Course : 13th April.—Temperature has been down three days. Physical signs, some friction along upper limit of lung, dullness and crepitations in axilla. Delirium has ceased. Patient asks for food. Has had and still has much albumen in urine. Is decidedly knocked out.

16th April.—Discharged well.

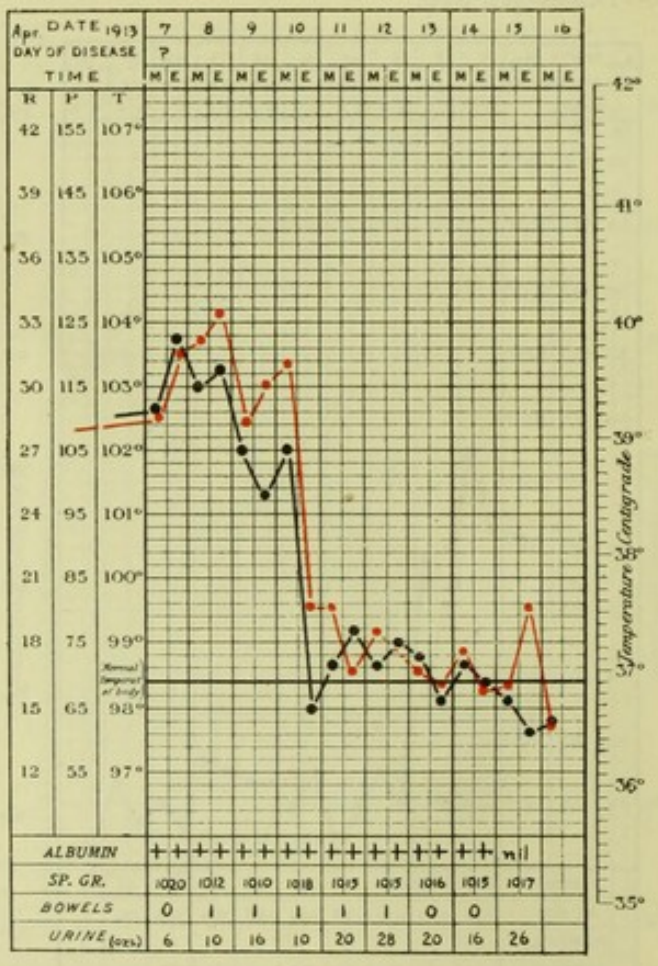


Chart 26

Case 15

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 7th April, 1913.

Date of discharge : 25th April, 1913.

History.—Admitted for ' fever ' symptoms.

Condition on admission.—Temperature, 103·8° Fahr. Pulse, 122. Bronchitic signs. Urine, albuminous.

Course : 10th April.—Temperature remains high. Now signs of pneumonia right base. Much albumen first two days. Yesterday a trace. Patient very sick. Complains of pains in limbs and loins.

13th April.—Still runs a fair temperature and is very seedy.

24th April.—Discharged well.

No quinine treatment.

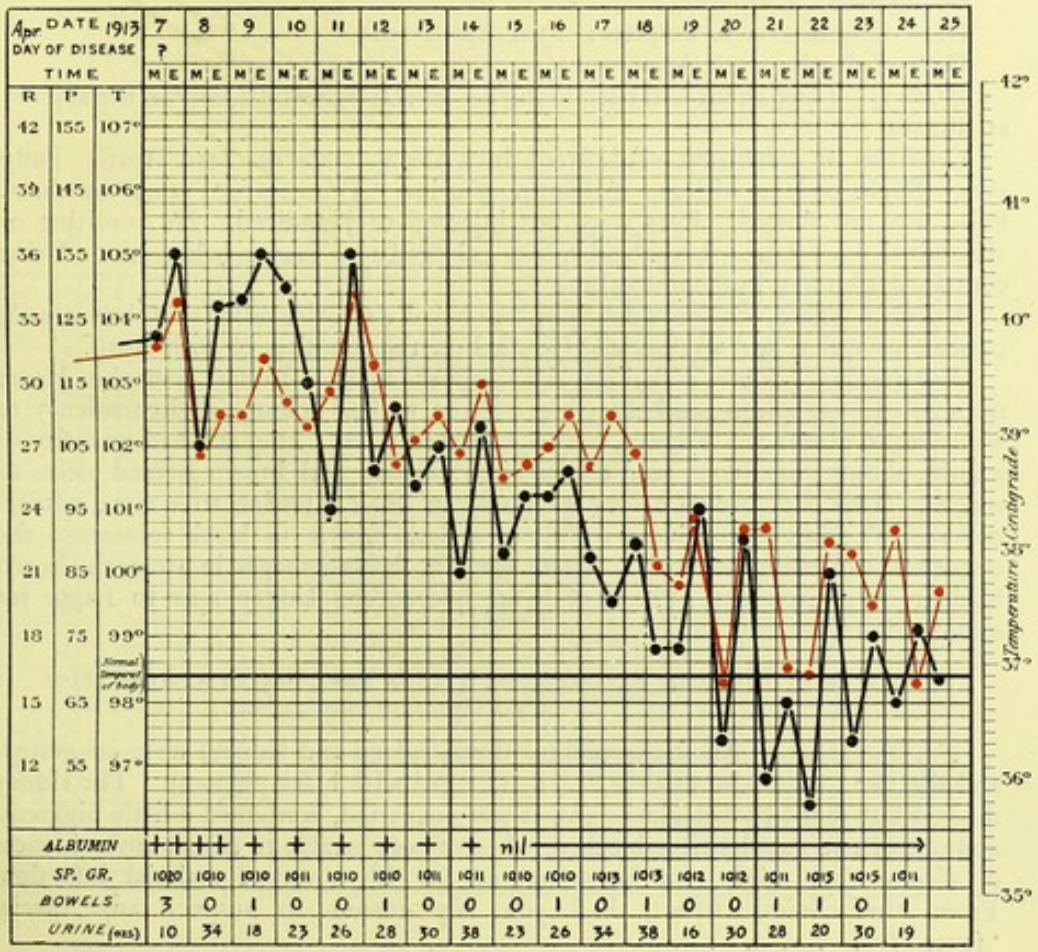


Chart 27

Case 16. L. 13†

Race : Negro.
Age : 29.
Sex : Male.
Occupation : Labourer.
Date of admission to hospital : 8th April, 1913.
Date of discharge : 18th April, 1913.

History.—Admitted so deaf as to be useless for any history.

Condition on admission.—Temperature, 103·4° Fahr. Pulse, 124. Tongue, coated with fur. Spleen, enlarged two fingers below ribs. Albuminuria marked. Deafness ceased on 25th April.

Case completed shows a fever, not malarial, characterized by : Albuminuria. Slow pulse. Typical temperature chart. White fur on tongue. Deafness.

Case 17. L. 5†

Race : Negro.
Age : 16.
Sex : Male.
Occupation : Labourer.
Date of admission to hospital : 23rd April, 1913.
Date of death : 25th April, 1913.

History.—The patient had been living for several weeks on a ship on the slipway at Burutu.

Condition on admission.—Admitted in a sleepy state on 23rd April. Puffy eyes. Slight oedema of legs. Albuminous urine. Temperature ran as by chart. Pulse was not slowed. Eyes were not injected or jaundiced. No vomiting or abdominal symptoms. Liver and spleen enlarged two fingers below ribs. Urine contained albumen but no blood.

Course.—There was some delirium on second day after admission, but usually patient lay quiet, and apathetic. He died on the morning of 26th April.

Post-mortem.—Some adhesions right upper chest. Lungs normal. Heart normal. Liver, spleen and kidney big. Liver, natural colour—slight tendency to a nutmeg appearance. Kidney, cortex appeared fatty. Stomach had quantity of a fluid, about 3 ozs., composed of mucus, water and dark brown stained pieces of mucus. This dark brown colour gave way in small intestine to a more natural colour. The large intestine was full of a dark brown or black substance, the consistency of thick pea-soup. There were no haemorrhages in stomach, heart, bladder or peritoneum. Pieces of liver, spleen, and kidney sent to Lagos for examination.

Report from Medical Research Institute, Yaba, on Specimens from Case 17

. . . . . All the specimens (liver, spleen and kidney) were congested, and the two former tissues were heavily charged with black pigment. The kidney showed but slight pathological signs, it was congested, contained a little pigment, and one or two tubules were blocked. I have been unable to detect any evidences of disease that might not be accounted for by a recent malarial infection. From the clinical aspect, had you any reason to suspect any special 'fever'? . . . . . .

J. W. Scott Macfie.

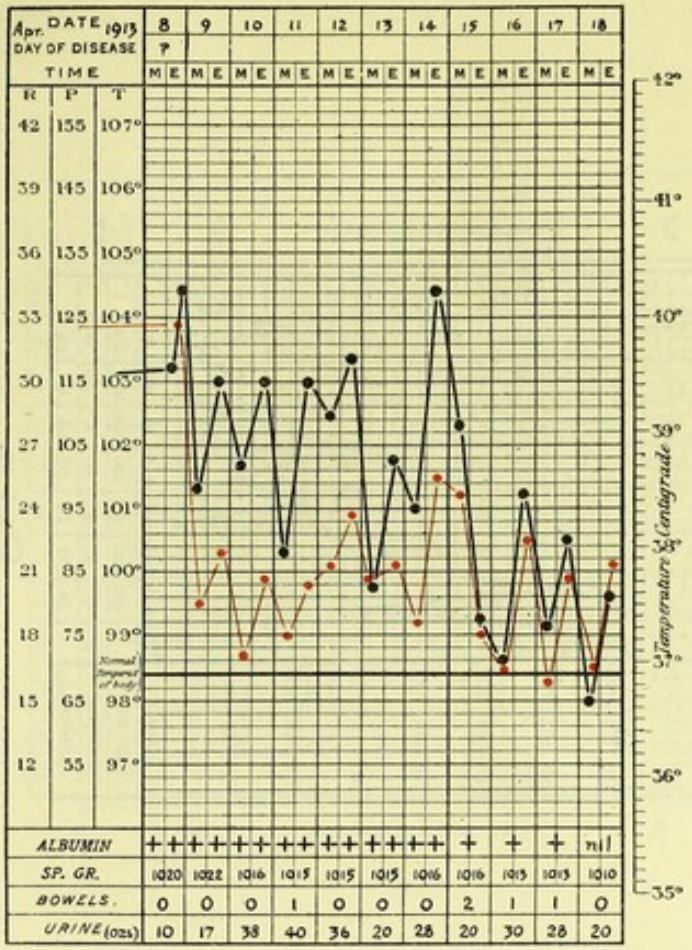


Chart 28. Case 16

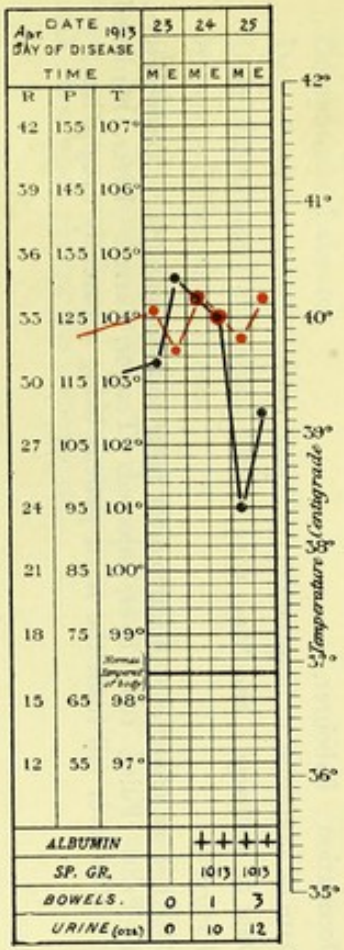


Chart 29. Case 17

CASE 18. *Commission number not obtainable**

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 24th April, 1913.

Date of discharge : 2nd May, 1913.

History.—

Condition on admission.—Admitted for fever and albuminuria. Temperature, 103·4° Fahr. Pulse, 108. Eyes, injected. Tongue, furred. Liver, hardened a bit. The fever fell from the start, patient being apparently caught late.

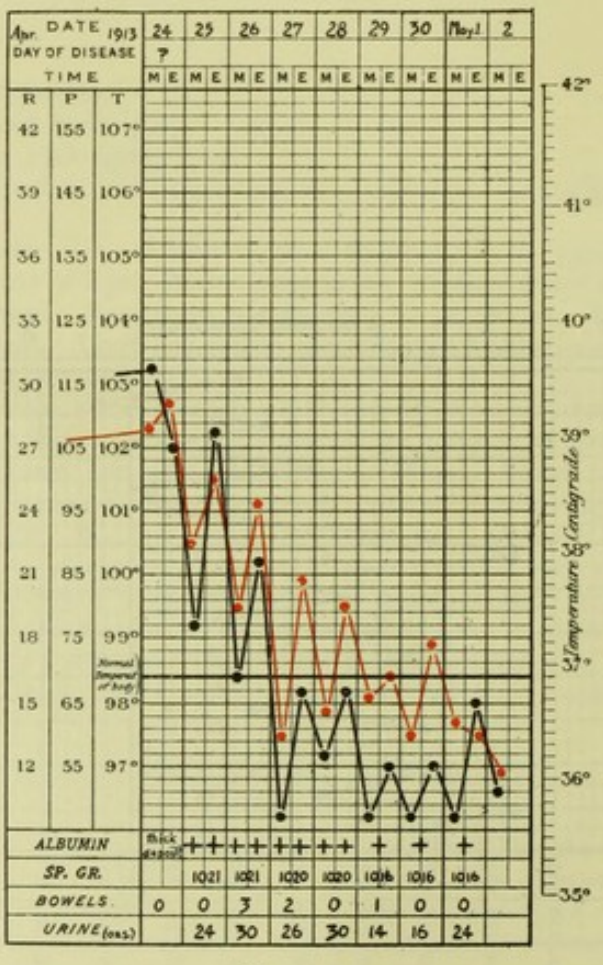


Chart 30.

CASE 19. *Commission number not obtainable**

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 8th May, 1913.

Date of discharge : 18th May, 1913.

History.—Of two days' illness.

Condition on admission.—Temperature, 105° Fahr. Pulse, 118. Tongue, some fur. Bowels, not open. Chest, negative. Liver, hard, not enlarged. Spleen, enlarged two fingers. Urine, albuminous on admission. Continued so till 16th May, when patient was convalescent.

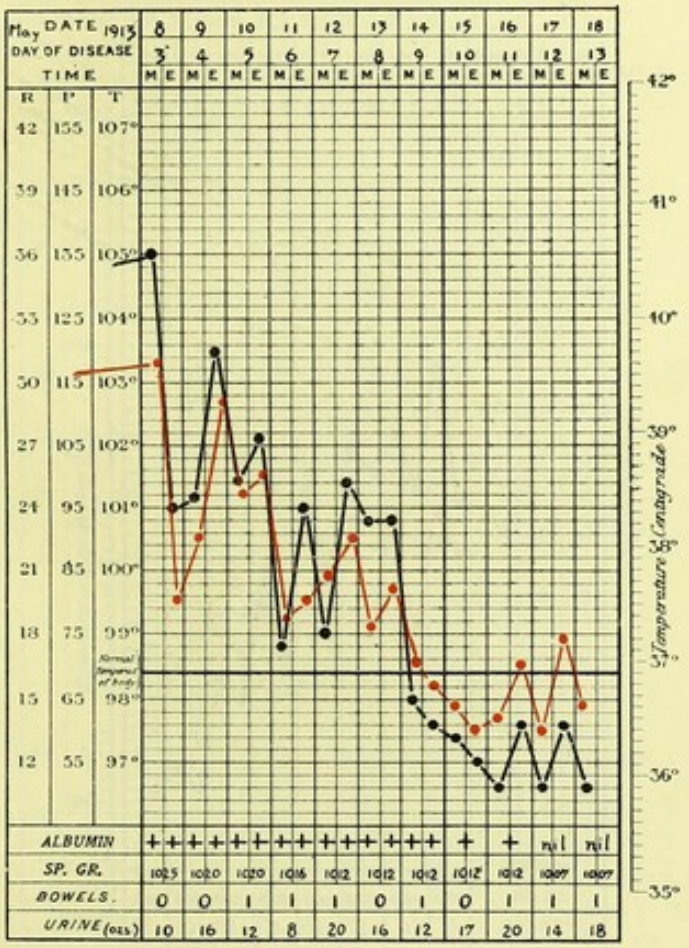


Chart 31.

CASE 20. L. 60†

Race : Negro.

Age : 26.

Sex : Male.

Occupation : Pauper.

Date of admission to hospital : 9th July, 1913.

Date of discharge : 16th July, 1913.

History.—Of two days' illness.

Condition on admission.—Complains of pain over sternum. Temperature, 101·5° Fahr. Pulse, 92. Tongue, red, with white fur. Mouth, dirty. Chest and abdomen, negative. Blood, negative. Urine, not albuminous. Temperature remained about same level for first three days in hospital, and then fell by lysis. Case appeared of same type as others reported from here, but the absence of albumen in the urine is noteworthy. No quinine given.

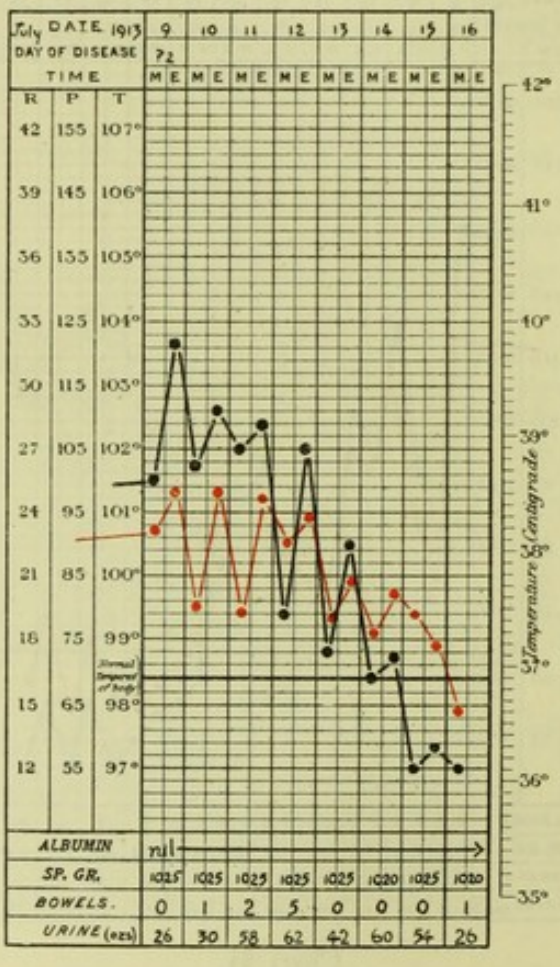


Chart 32.

CASE 21. L. 62†

Race: Negro.

Age: 29.

Sex: Male.

Occupation: Labourer.

Date of admission to hospital: 31st July, 1913.

Date of discharge: 9th August, 1913.

History.—Four days' history of fever.

Condition on admission.—Temperature, 101·5° Fahr. Pulse, 82. Eyes, not red. Tongue, white fur. Chest, negative. Abdomen, spleen three fingers below ribs. Urine, albuminous, reducing with convalescence. Blood, *Paraplasma* found.

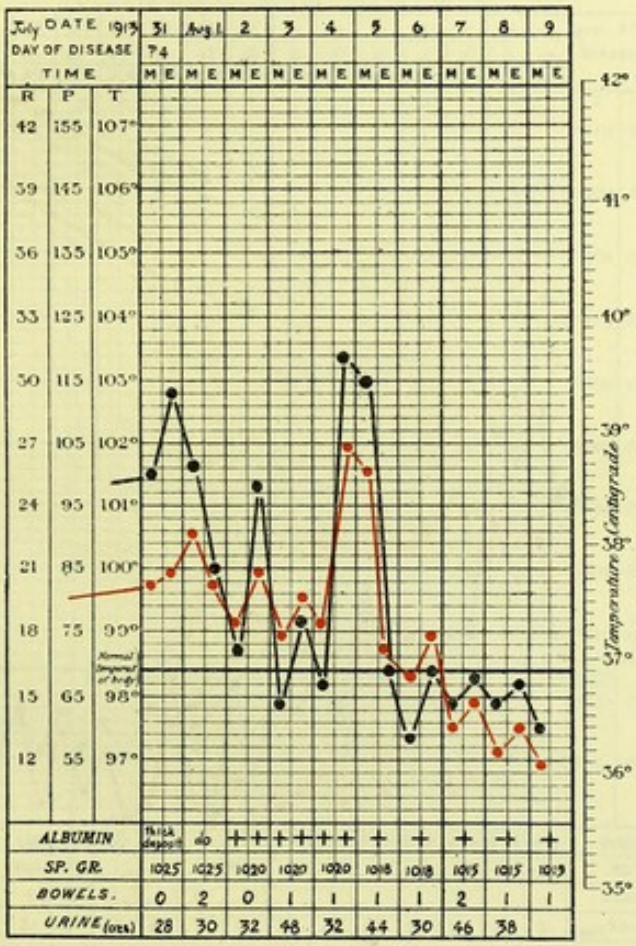


Chart 33.

CASE 22. *Commission number not obtainable*

Race : Negro.

Age : —

Sex : Male.

Occupation : Fireman.

Date of admission to hospital : 5th May, 1913.

Date of discharge : 18th May, 1913.

History.—Two days' fever.

Condition on admission.—Temperature, 101·5° Fahr. Pulse, 72. Eyes, not injected. Physical examination negative except that liver was palpable. No vomiting or jaundice. Temperature fell on 7th May, and stayed down. Urine, albuminous on admission ; continued so till 14th May.

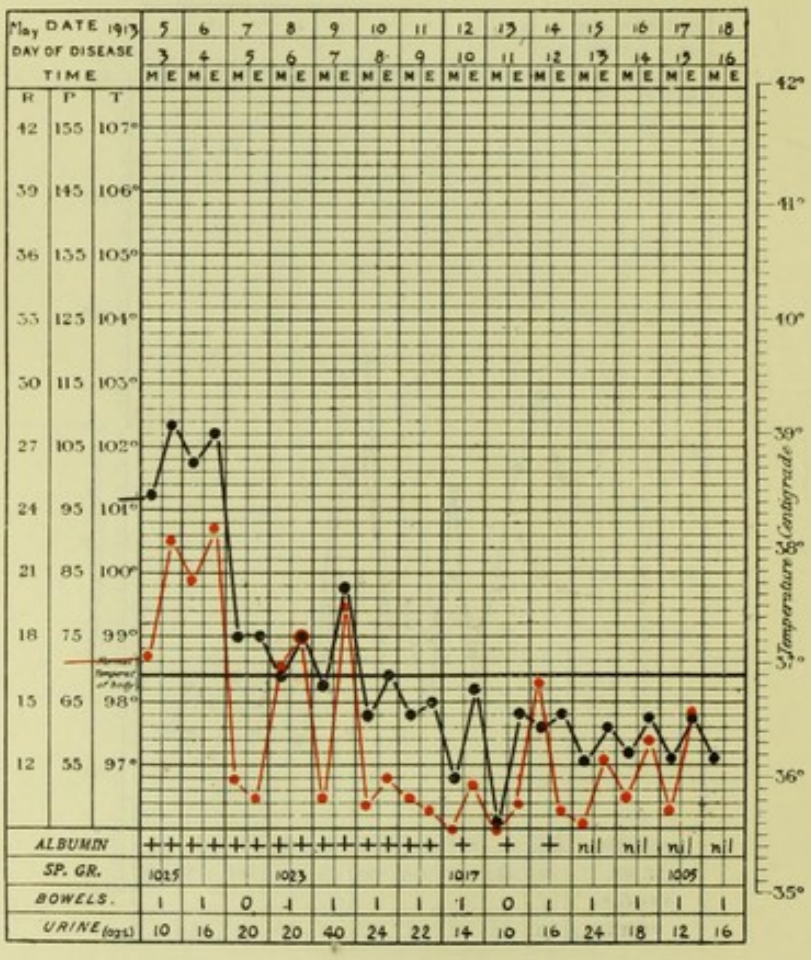


Chart 34

CASE 23. L. 61†

Race : Negro.

Age : 27.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 24th July, 1913.

Date of discharge : 30th July, 1913.

History.—Of one day's duration. Complained of pain in chest and head.

Condition on admission.—Temperature, 100·2° Fahr. Pulse, 78. Eyes, not injected. Tongue, clean and moist. Chest, some slight bronchitic signs ; no tenderness over sternum. Abdomen, negative. Urine, thick albumen, getting less with convalescence. A mild fever.

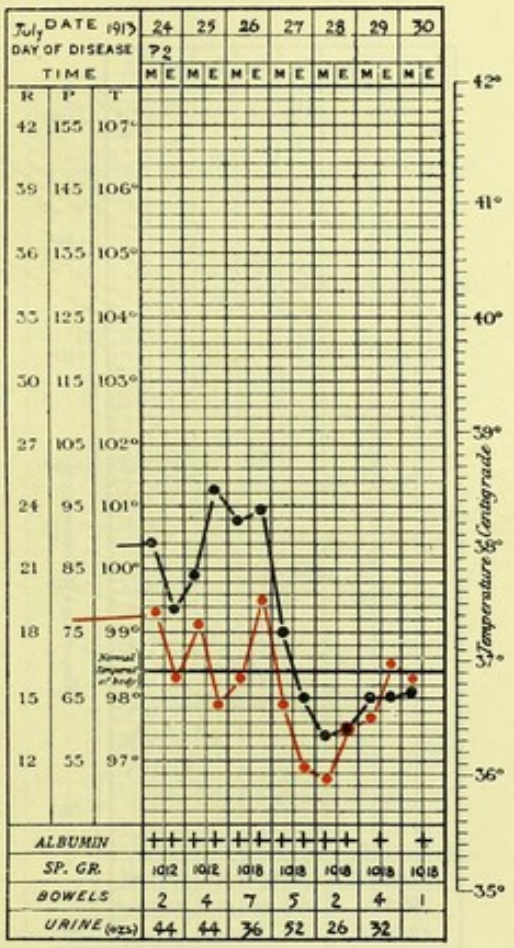


Chart 35

Case 24. L. 74†

Race : Negro.

Age : 24.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 29th August, 1913.

Date of discharge : 2nd September, 1913.

History.—Indefinite.

Condition on admission.—Temperature, 100·8° Fahr. Pulse, 86. Eyes, somewhat injected. Tongue, clean. Chest and abdomen, negative; no nausea, vomiting, or epigastric tenderness. Urine, albuminuria, which cleared up in three days; quantity, normal; no blood, casts, or bile pigment. Skin, dry. Haemorrhages absent. Stools, normal. Nervous system, nil.

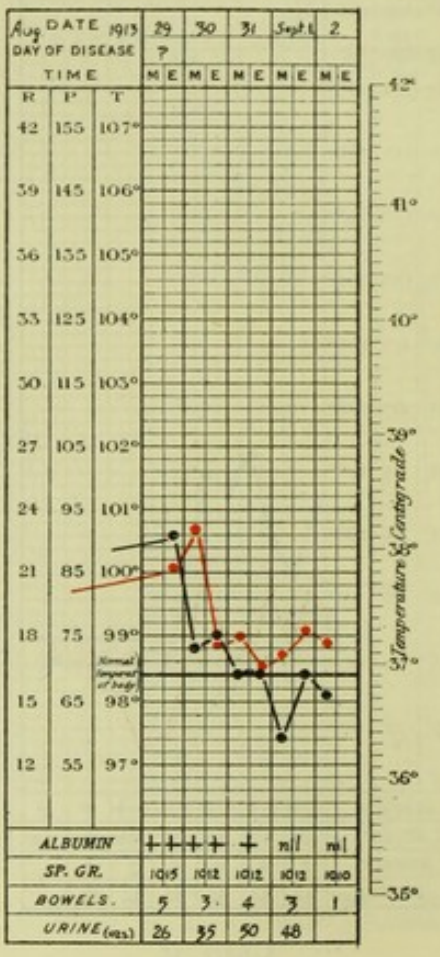


Chart 36

Case 25. L. 801

Race : Negro.

Age : 12.

Sex : Male.

Occupation : Pauper.

Date of admission to hospital : 3rd September, 1913.

Date of discharge : 8th September, 1913.

History.—Stated that he had been seedy for two weeks since arriving at Forcados. His master said he had been constipated.

Condition on admission.—Temperature, 101·4° Fahr. Pulse, 116; Faget's sign absent. Eyes, he had a heavy-eyed appearance. Tongue, red, with white fur. Chest and abdomen, negative ; no nausea, vomiting, or epigastric tenderness. Urine, a slight cloud of albumen in first specimen only ; quantity, increased ; no blood, casts, or bile pigment. Stools, normal ; constipated. Haemorrhages, absent. Skin, normal.

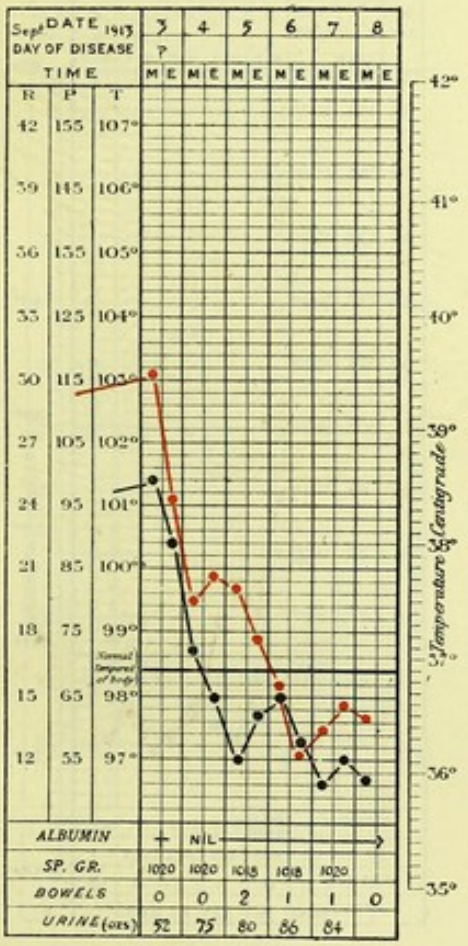


Chart 37

Case 26. L. 75†

Race : Negro.

Age : 17.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 4th September, 1913.

Date of discharge : 8th September, 1913.

History.—History of one day's headache.

Condition on admission.—Temperature, 100° Fahr. Pulse, 94. Eyes, not injected. Tongue, red and furred. Chest and abdomen, negative except spleen enlarged hand's-breadth below ribs ; no nausea, vomiting, or epigastric tenderness. Urine, marked albuminuria first three days ; quantity somewhat increased ; no blood, casts, or bile pigment. Stools, normal ; constipated. Skin, dry. Haemorrhages, absent. A very mild case.

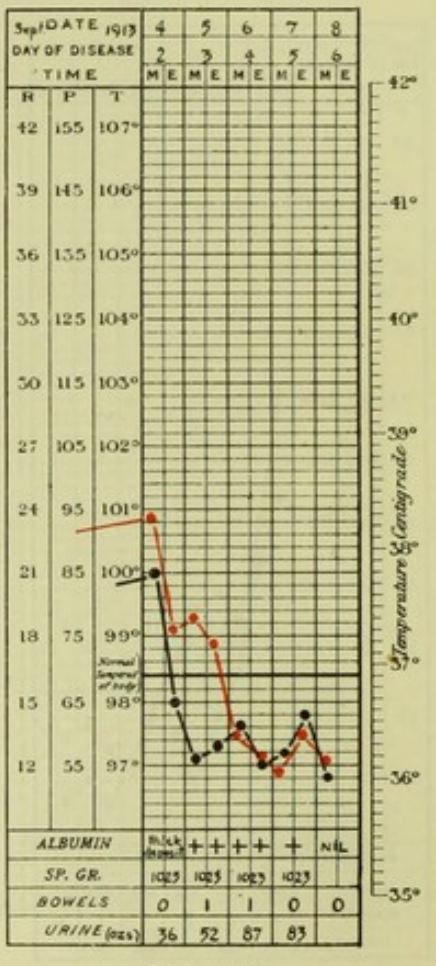


Chart 38

CASE 27. L. 76†

Race : Negro.

Age : 13.

Sex : Male.

Occupation : Schoolboy.

Date of admission to hospital : 5th September, 1913.

Date of discharge : 9th September, 1913.

History.—History of pain in head day before ; also pain in belly.

Condition on admission.—Temperature, 103·5° Fahr. Pulse, 126. Eyes, not red. Tongue, slight white fur. Chest, negative. Abdomen, said to be painful all over, but not tender to pressure ; no nausea or vomiting ; spleen enlarged three fingers'-breadth and liver enlarged two fingers'-breadth below ribs. Urine, albumen present ; quantity increased ; no blood, casts, or bile pigment. Skin, nil. Haemorrhages, absent. Stools, normal. Jaundice. absent. A mild case.

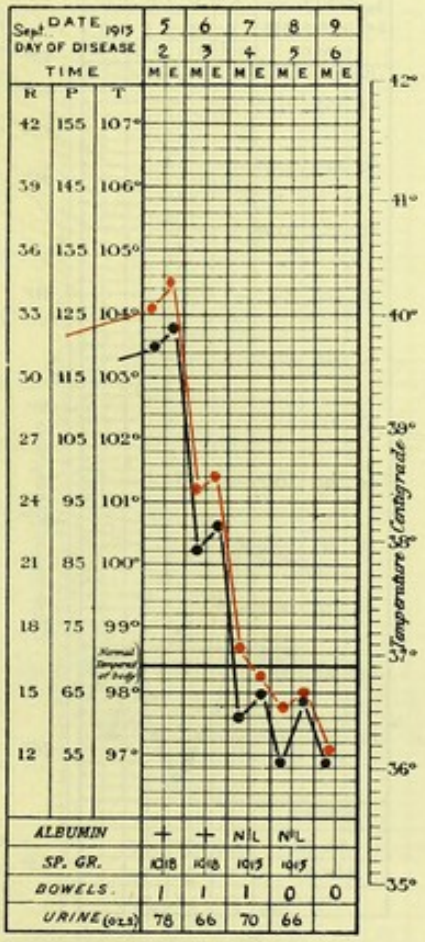


Chart 39

Case 28. L. 77†

Race : Negro.

Age : 22.

Sex : Male.

Occupation : Clerk.

Date of admission to hospital : 8th September, 1913.

Date of discharge : 11th September, 1913.

History.—Stated that he had fever two days before admission.

Condition on admission.—Temperature, 100° Fahr. Pulse, 86. Eyes, slightly injected. Tongue, clean ; red. Chest and abdomen, negative ; no nausea, vomiting, or epigastric tenderness. Urine, slight cloud of albumen on day of admission ; absent next day ; quantity, normal ; no blood, casts, or bile pigment. Stools, normal. Skin, nil. Haemorrhages, absent. Jaundice, absent.

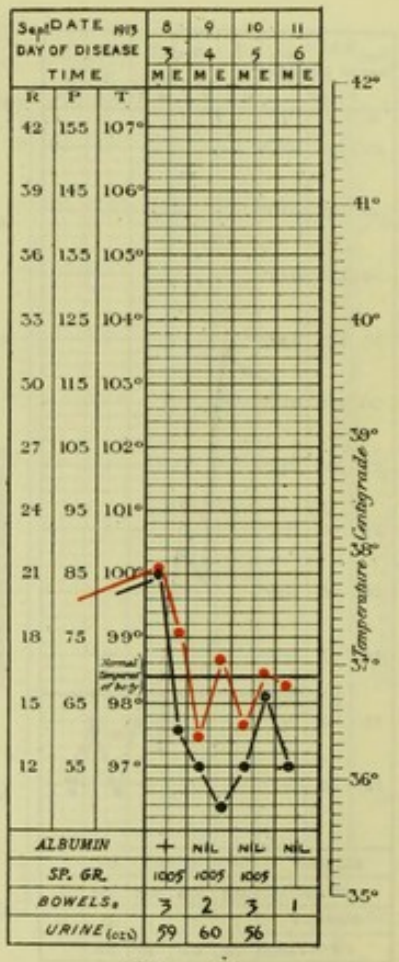


Chart 40

CASE 29. L. 781

Race : Negro.

Age : 16.

Sex : Male.

Occupation : Pauper.

Date of admission to hospital : 9th September, 1913.

Date of discharge : 17th September, 1913.

History.—Stated to be second day of fever.

Condition on admission.—Temperature, 99·8° Fahr. Pulse, 94. Eyes, not injected. Tongue, clean ; red. Chest, base of right lung some crepitations, with slight cough ; no dullness. Abdomen, spleen just below ribs ; otherwise no signs ; no nausea, vomiting, or epigastric tenderness. Urine, albuminuria, which diminished with the fever ; quantity, normal ; no blood, casts, or bile pigment. Jaundice, absent. Skin, normal. Stools, normal. A very mild case.

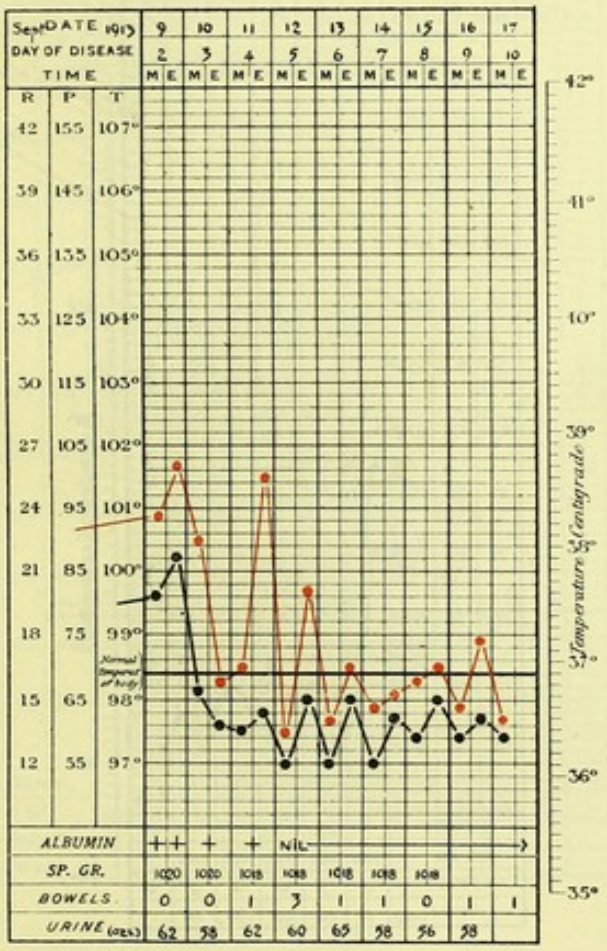


Chart 41

CASE 30. L. 791

Race : Negro.

Age : 26.

Sex : Male.

Occupation : Servant.

Date of admission to hospital : 12th September, 1913.

Date of discharge : 17th September, 1913.

History.—Admitted, according to his account, on the sixth day of fever.

Condition on admission.—Temperature, 101·5° Fahr. Pulse, 86. Eyes, not injected. Tongue, red, white fur. Chest and abdomen, negative ; no nausea, vomiting, or epigastric tenderness. Urine, trace of albumen found on the first day in hospital, cleared up rapidly and convalescence began ; quantity, normal except first day, when small ; no blood, casts, or bile pigment. Stools, normal. Jaundice, absent. Haemorrhages, absent. Skin, normal. A very mild case.

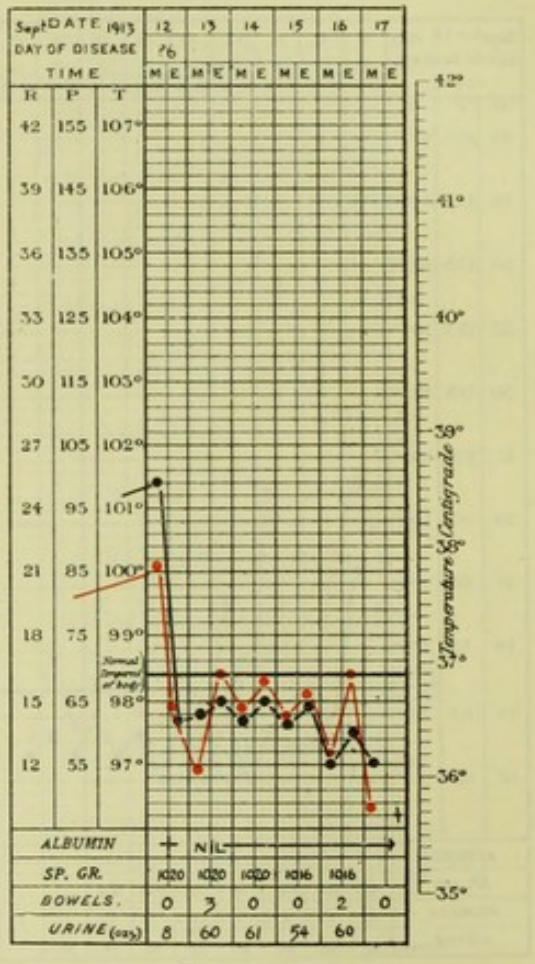


Chart 42

Case 31. L. 97†

Race : Negro.

Age : 24.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 22nd September, 1913.

Date of discharge : 3rd October, 1913.

History.—History of three days' illness before admission, headache and pains in epigastrium ; some joint pains, said to have finished on admission.

Condition on admission.—Temperature, 102·4° Fahr. Pulse, 126. Eyes, not injected. Tongue, red ; slightly tremulous. Chest and abdomen, negative ; slight cough. Urine, cloud of albumen.

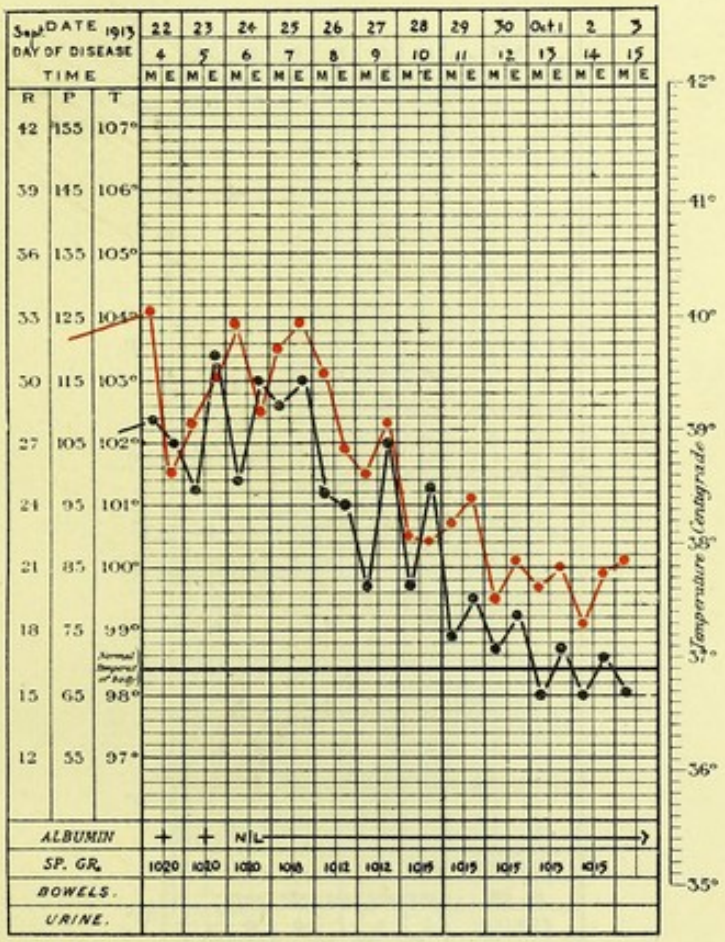


Chart 43

CASE 32. L. 96†

Race : Negro.

Age : 22.

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 23rd September, 1913.

Date of discharge : 28th September, 1913.

History.—History of being taken ill day before admission, with headache Found to have albuminuria and admitted.

Condition on admission.—Temperature, 99·8° Fahr. Pulse, 120. Eyes, slightly injected. Tongue, red ; white fur on dorsum. Chest and abdomen, negative.

The patient had lived in the Asaba ' boys ' house, Messrs. Elder Dempster's ' beach,' for four months.

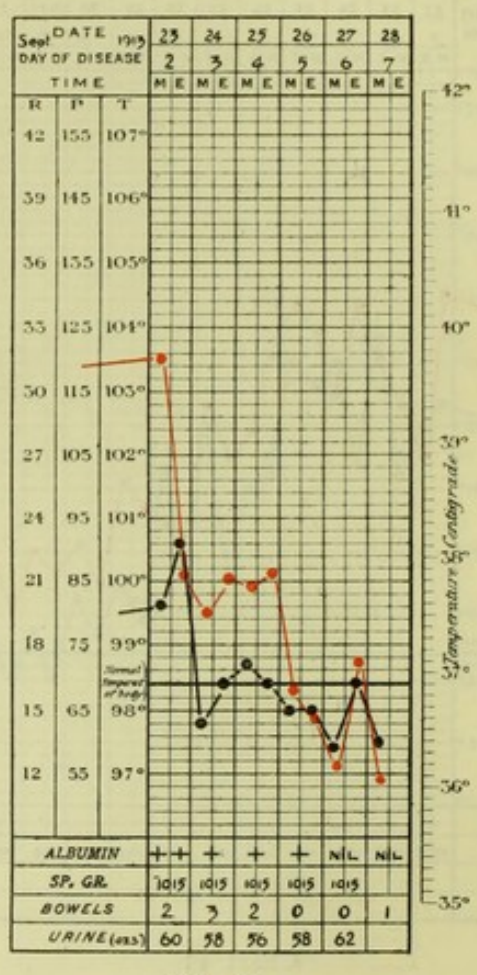


Chart 44

CASE 33. L. 95†

Race : Negro.

Age : 23.

Sex : Male.

Occupation : Engineer.

Date of admission to hospital : 25th September, 1913.

Date of discharge : 28th September, 1913.

History.—On admission complained of a light fever lasting to this, the fourth day.

Condition on admission.—Temperature, 98·4° Fahr. Pulse, 72. Eyes, not injected. Tongue, moist and good ; slight white fur. Chest, negative. Abdomen negative, except that liver just palpable on deep expiration. No headache or pain. Urine, found free from albumen day before admission ; a cloud on day of admission.

The patient had lived in the Mechanics' Lines at Forcados for twenty-two months.

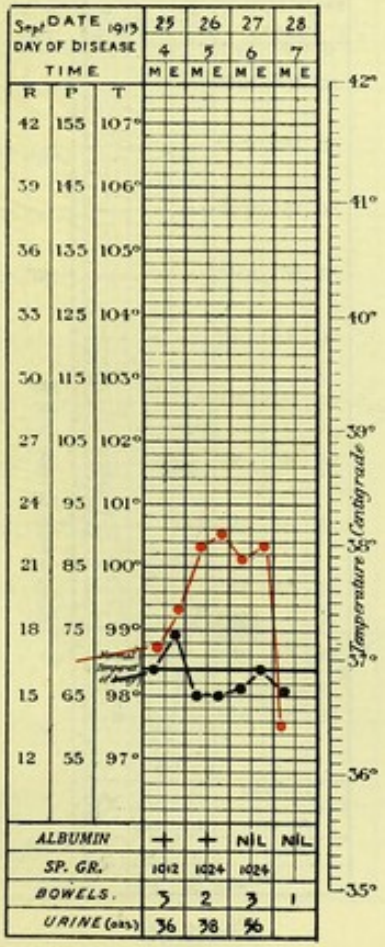


Chart 45

Case 34. L. 99†

Race: Negro.

Age: 24.

Sex: Male.

Occupation: Clerk.

Date of admission to hospital: 26th September, 1913.

Date of discharge: 28th September, 1913.

History.—Stated that he had headache yesterday. No fever.

Condition on admission.—Professed to be quite well. Temperature, 98·8° Fahr. Pulse, 86. Eyes, not injected. Tongue, moist; very slight fur. Chest and abdomen, negative. Urine, a slight cloud of albumen.

The patient lived in the most westerly of the 'Pigeon beach' houses.

The *Paraplasma flavigenum* was found in the blood at the Medical Research Institute, Yaba.

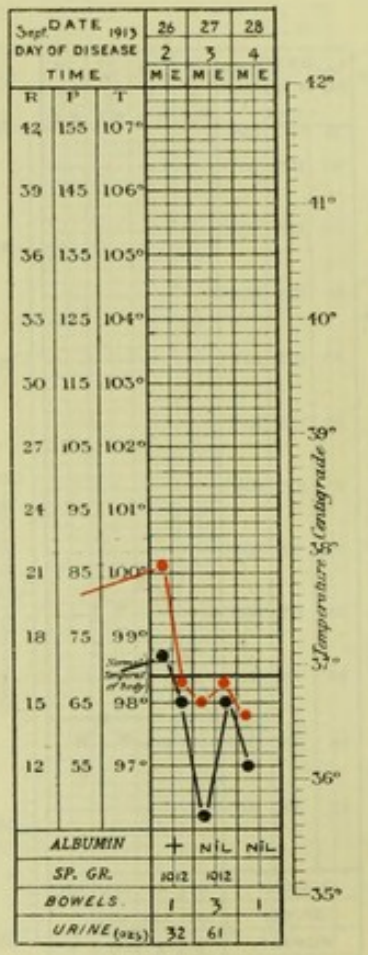


Chart 46

Case 35. L. 94†

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer (fireman on station launch ' Aro.').

Date of admission to hospital : 26th September, 1913.

Date of discharge : 3rd October, 1913.

History.—Began to be ill two days before admission—constipation, headache, eyeache.

Condition on admission.—Temperature, 100·2° Fahr. Pulse, 112. Eyes, ? slight injection. Tongue, indented ; not bright red ; thick white fur ; breath very foul. Chest, some crepitations right base ; no cough acknowledged or heard. Abdomen, negative. Urine, albuminous.

The patient lives on ' Chikoko Beach,' Forcados.

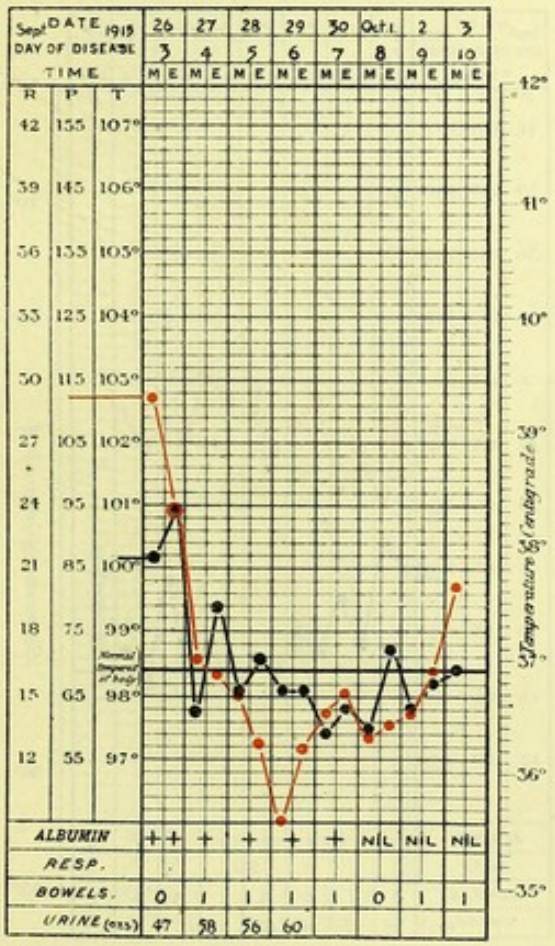


Chart 47

Case 36. L. 98†

Race: Negro.

Age: 24.

Sex: Female.

Occupation: Pauper.

Date of admission to hospital: 26th September, 1913.

Date of discharge: 3rd October, 1913.

History.—Ill for over a week—headache; later, pains in joints.

Condition on admission.—Temperature, 100° Fahr. Pulse, 110. Eyes, not injected. Tongue, very light fur. Chest, negative. Abdomen, liver palpable on expiration; spleen not palpable. Urine, albuminous.

The patient had lived for some time in the Mechanics' Lines, Forcados.

Malaria parasites were found in the blood at the Medical Research Institute, Yaba.

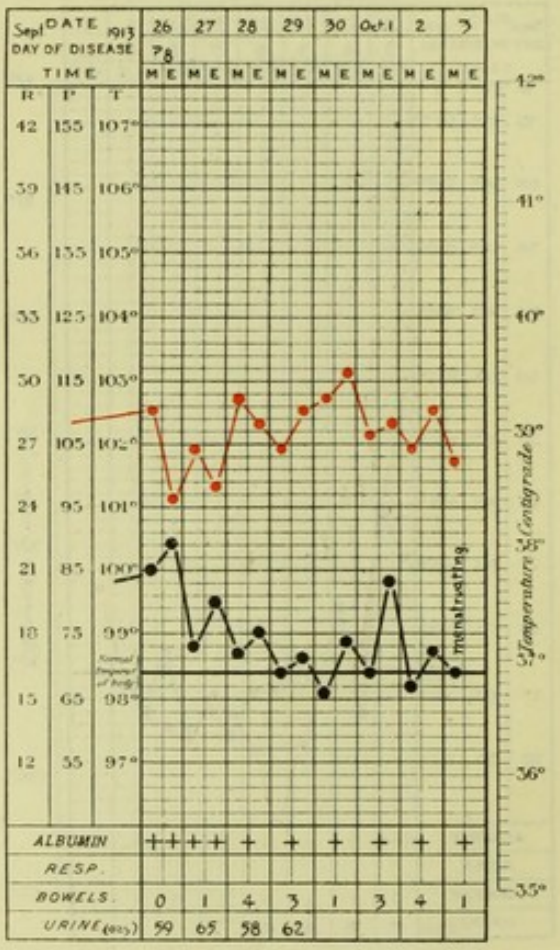


Chart 48

Case 37. L. 93†

Race : Negro.

Age : —

Sex : Male.

Occupation : Labourer.

Date of admission to hospital : 23rd September, 1913.

Date of discharge : 26th September, 1913.

History.—Began to be ill day before admission. 'Cold catch him' and 'belly full up,' causing constipation.

Condition on admission.—Temperature, 103·4° Fahr. Pulse, 100. Eyes, not injected. Tongue, slightly furred. Chest, negative. Abdomen, liver felt on deep expiration. Urine, not albuminous.

Patient lives on 'stern-wheeler' 'Egbon,' alongside wharf.

'Seidelin bodies' found by Dr. Seidelin.

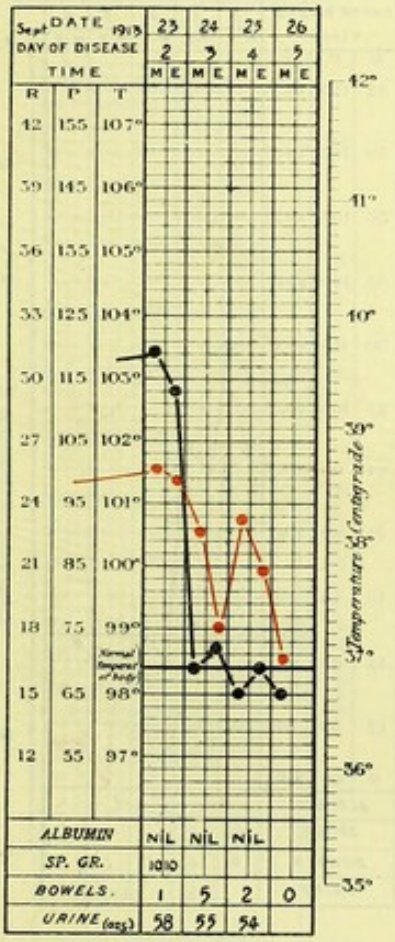


Chart 94

CASE 38. L. 92†

Race : Negro.

Age : —

Sex : Male.

Occupation : —

Date of admission to hospital : 3rd October, 1913.

Date of discharge : 7th October, 1913.

History.—The illness began day before admission, with pains in head and back over top of sacrum.

Condition on admission.—Temperature, 102·2° Fahr. Pulse, 96. Eyes, injected. Tongue, white fur. Breath, foul. No constipation. No epigastric tenderness. Chest, slight systolic murmur at apex, not conducted. *No* albuminuria.

The patient was treated with quinine.

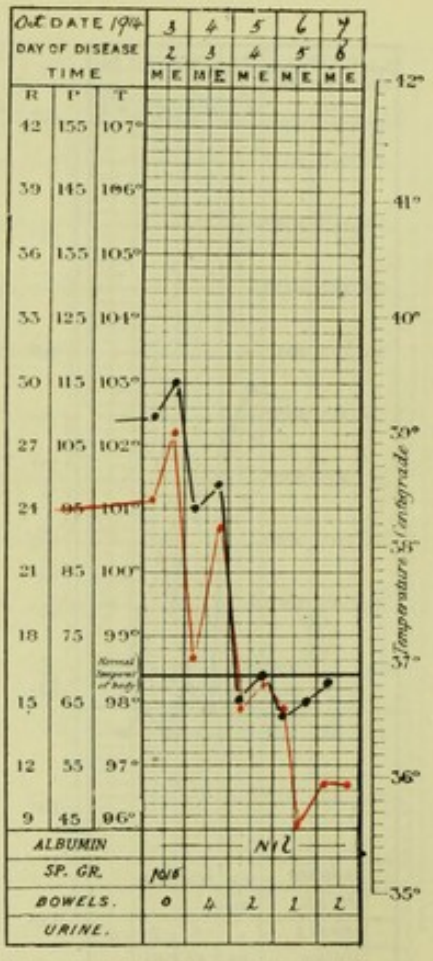


Chart 50

CASE 39

Race : Negro.

Age : 28.

Sex : Male.

Occupation : Clerk.

Date of admission to hospital : 8th October, 1913.

Date of discharge : 9th October, 1913.

8th October.—Patient felt tired last night after sea-trip on s.s. 'Niger' from Lagos. Is always very seasick. Admitted this morning with temperature at 99·4° and very slight albuminuria. Chest, negative. Abdomen, liver just palpable on very deep expiration, otherwise absolutely negative. Eyes, not the least injection. Tongue, yellow fur, said to be habitual, on dorsum.

9th October.—Albumen not found by self yesterday afternoon in carefully filtered specimen, nor this morning. Albuminuria taken to be 'cyclical' and man discharged.

(He left Lagos at 3 p.m. on 6th, landed at Forcados at 5 p.m. on 7th, feeling well ; began to feel seedy after reaching his quarters.)

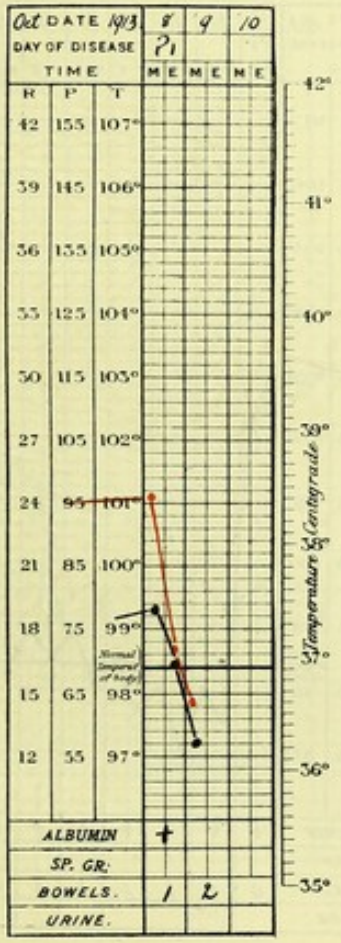


Chart 51

CASE 40. *Commission number not obtainable*

Race : Negro.

Age : 26.

Sex : Male.

Occupation : Prisoner.

Date of admission to hospital : 9th October, 1913.

Date of discharge : 15th October, 1913.

History.—Found to be 'shaking' on morning of 9th. Has been attending out-patients' for boil on back.

Condition on admission.—Temperature, 103° Fahr. Pulse, 120. Eyes, not injected. Tongue, clean, red, moist. Chest and abdomen, negative. Urine, cloud of albumen.

Treatment.—Quinine 10 grains t.d.s. from the commencement.

Paraplasma flavigenum found at Medical Research Institute, Yaba.

This patient had been in Forcados Prison since 27th January, 1913.

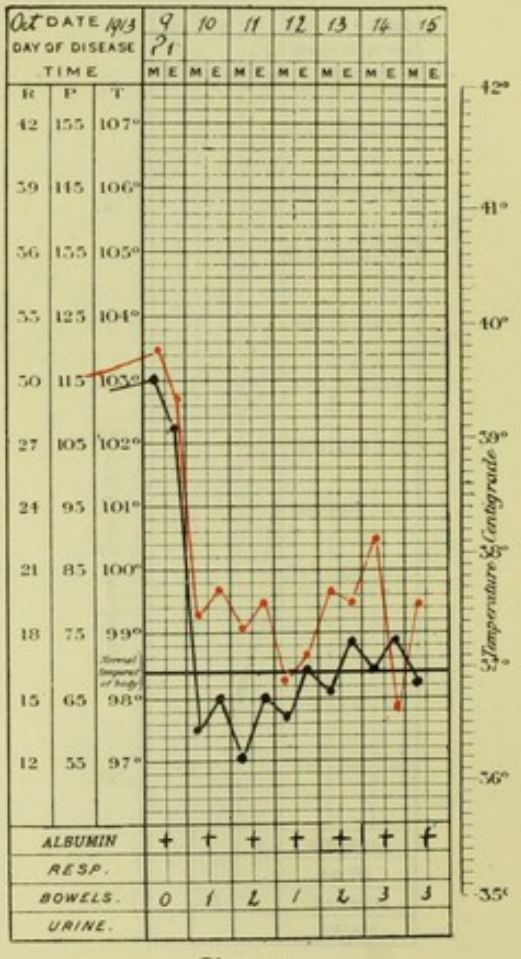


Chart 52

CASE 41. *Commission number not obtainable**

Race: Negro.

Age: 21.

Sex: Male.

Occupation: Labourer.

Date of admission to hospital: 10th October, 1913.

Date of discharge: 18th October, 1913.

History.—Said he began to be ill on morning of 9th; headache and 'fever.'

Condition on admission.—Temperature, 100·3° Fahr. Pulse, 116. Eyes, not injected. Tongue, pale; indented. Chest and abdomen, negative. Urine, albuminous.

The patient ran away from hospital, but was re-caught on the 14th.

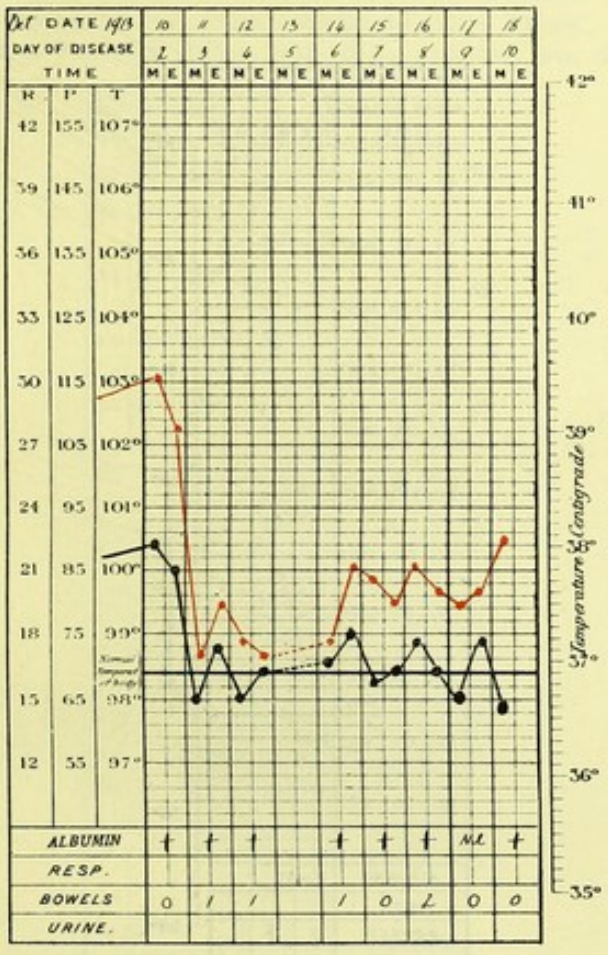


Chart 53

CASE 42. *Commission number not obtainable**

Race : Negro.

Age : 24.

Sex : Male.

Occupation : Prisoner.

Date of admission to hospital : 10th October, 1913.

Date of discharge : 11th October, 1913.

History.—Found shivering in prison on morning of 9th.

Condition on admission.—Temperature, 98° Fahr. Pulse, 78. Eyes, slightly injected. Tongue, moist ; clean. Chest and abdomen, negative. Urine, slight cloud of albumen.

Treatment.—The patient received quinine from the commencement, and the temperature fell at once.

This patient had been in Forcados Prison since 21st March, 1913.

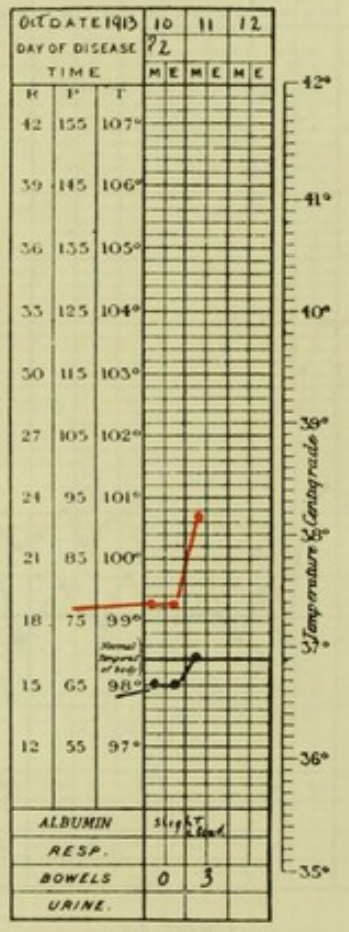


Chart 54

CASE 43. *Commission number not obtainable*

Race : Negro.

Age : 28.

Sex : Male.

Occupation : Prisoner.

Date of admission to hospital : 11th October, 1913.

Date of discharge : 15th October, 1913.

History.—The patient was on transfer from Onitsha to Lagos Prison. Brought to hospital on account of 'fever' in the night.

Condition on admission.—Temperature, 101° Fahr. Pulse, 96. Eyes, slightly injected. Tongue, moist ; slight white fur. Chest, negative. Abdomen, spleen just palpable, tender. Urine, very slight cloud of albumen made out with great difficulty on 14th.

Treatment.—Quinine 5 grains t.d.s.

Paraplasma flavigenum found at Medical Research Institute, Yaba.

This patient was on his way from Onitsha to Lagos Prison. He would not have been lodged in Forcados Prison more than, at most, four days.

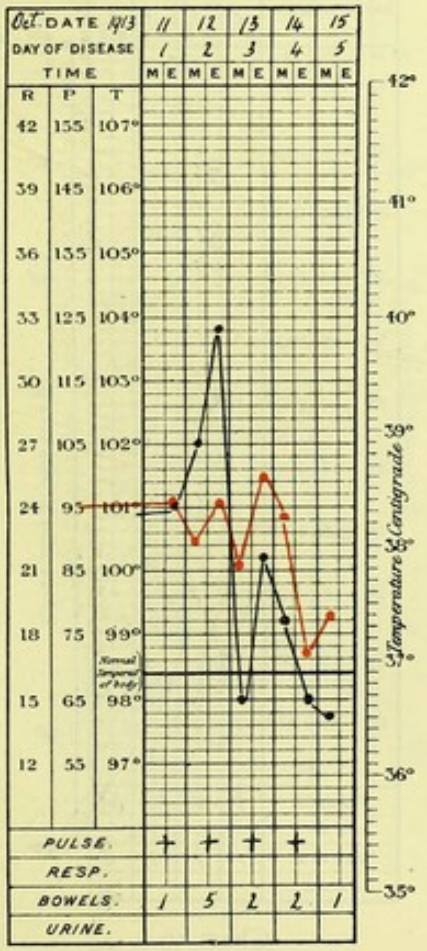


Chart 55

CASE 44. *Commission number not obtainable*

Race : Negro.

Sex : Male.

Age : 28.

Occupation : Engineer.

Date of admission to hospital : 15th October, 1913.

Date of discharge : 18th October, 1913.

History.—Began to feel ill on morning of 13th October, but went to work. Did not work on 14th. Had pain in eyes and left side, and says he had strong fever on night of 14th.

Condition on admission.—Examination negative, except that spleen is enlarged below the ribs and is tender. Liver slightly tender ; not enlarged. Urine, slight cloud albumen.

Paraplasma flavigenum not found at Medical Research Institute, Yaba.

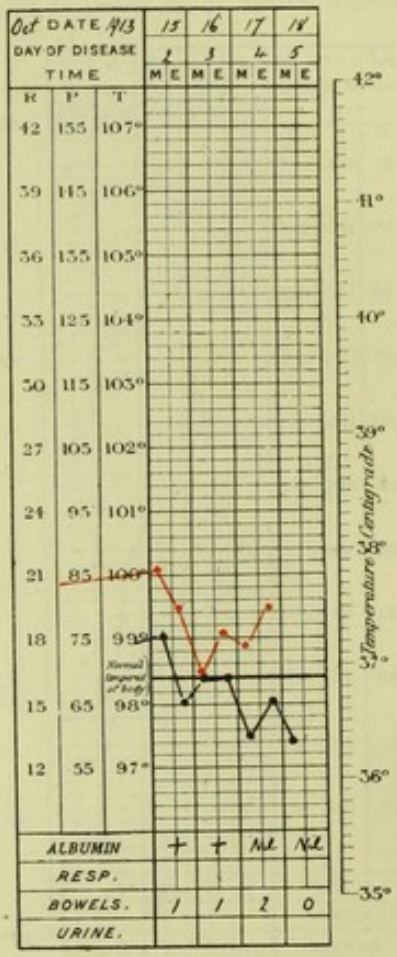


Chart 56

CASE 45. *Commission number not obtainable**

Race : Negro.

Age : 34.

Sex : Male.

Occupation : Clerk.

Date of admission to hospital : 15th October, 1913.

Date of discharge : 18th October, 1913.

History.—Nil.

Condition on admission.—Headache. Slight pyrexia, 99·2° Fahr. Pulse, 80. Urine, cloud of albumen.

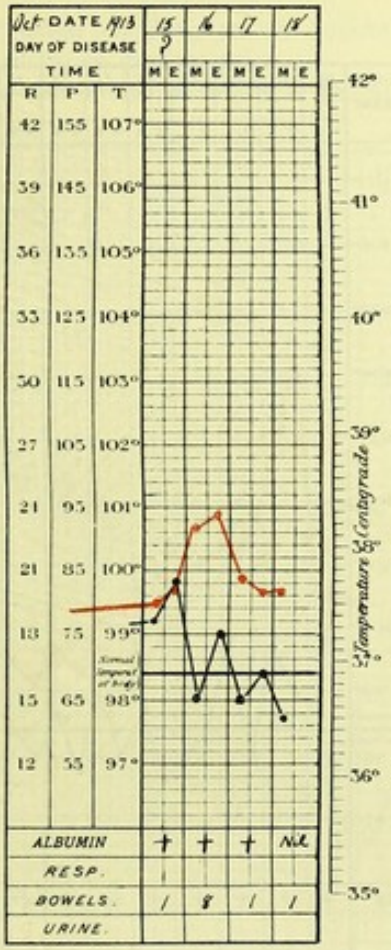


Chart 57

CASE 46. *Commission number not obtainable*

Race: Negro.

Age: 16.

Sex: Male.

Occupation: Labourer.

Date of admission to hospital: 19th October, 1913.

Date of discharge: 27th October, 1913.

History.—Taken off s.s. 'Effo' on sixth day of inspection after fumigation from Lagos.

Condition on admission.—Temperature, 102° Fahr. Pulse, 90. Eyes, not injected. Tongue, red, slight white fur. Chest and abdomen, negative. Urine, albuminous.

Paraplasma flavigenum not found at Medical Research Institute, Yaba.

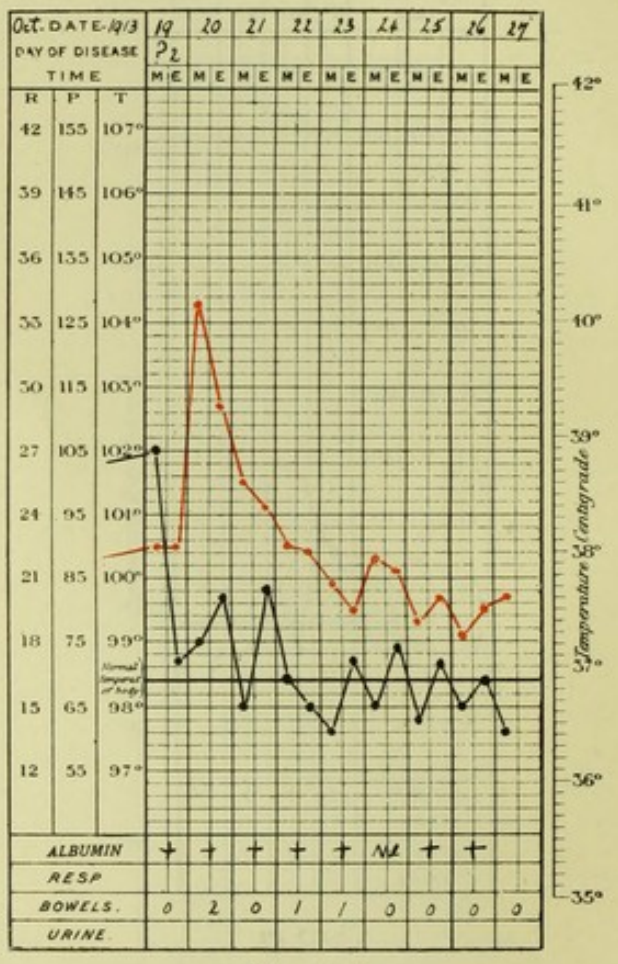


Chart 58

CASE 47. *Commission number not obtainable*

Race : Negro.
Age : 29.
Sex : Male.
Occupation : Labourer.
Date of admission to hospital : 20th October, 1913.
Date of discharge : 29th October, 1913.

History.—Admitted from s.s. 'Abonnema' from Lagos on the sixth day after arrival at Forcados. The vessel had been fumigated on arrival. Taken ill with headache on the night before admission.

Condition on admission.—Temperature, 103·8° Fahr. ; no signs discovered to account for temperature. Pulse, 130. Eyes, not injected. Tongue, red, slight white fur. Respiration, rapid ; no cough ; snuffing nose. Chest and abdomen, negative. Urine, no albumen.

Course : 21st October.—Now complains of pain in lumbar region. Bilious vomit in the night.

23rd October.—Light cloud of albumen on boiling. Bronchitic signs both lungs behind. Still complains of lumbar pain.

Paraplasma flavigenum not found at Medical Research Institute, Yaba.

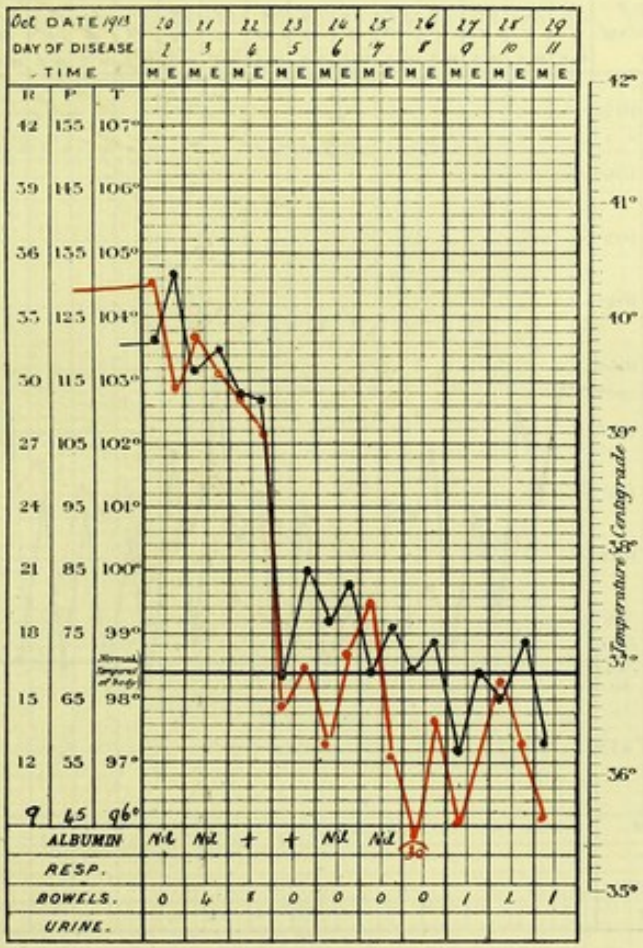


Chart 59

CASE 48. *Commission number not obtainable*

Race : Negro.
Age : 38.
Sex : Male.
Occupation : Fireman, s.s. ' Iddo.'
Date of admission to hospital : 21st October, 1913.
Date of discharge : 3rd November, 1913.
Diagnosis : Phthisis.

Note.—Paraplasma flavigenum found at Medical Research Institute, Yaba.

History.—Admitted from s.s. ' Iddo ' on the fourth day after her arrival from Lagos. The vessel had been fumigated on arrival at Forcados. Ill three days. Cough causing pain in right axilla.

Condition on admission.—Temperature, 102·6° Fahr. Pulse, 112. Eyes, rather yellower than usually seen. Tongue, natural. Abdomen, negative. Chest, a good deal of cough ; note at right base not so good as left, but nothing definite made out. Urine, slight cloud of albumen.

Course : 25th October.—Distinct pneumonic patch about three inches in diameter on fourth rib in front right side, with crepitations in right axilla.

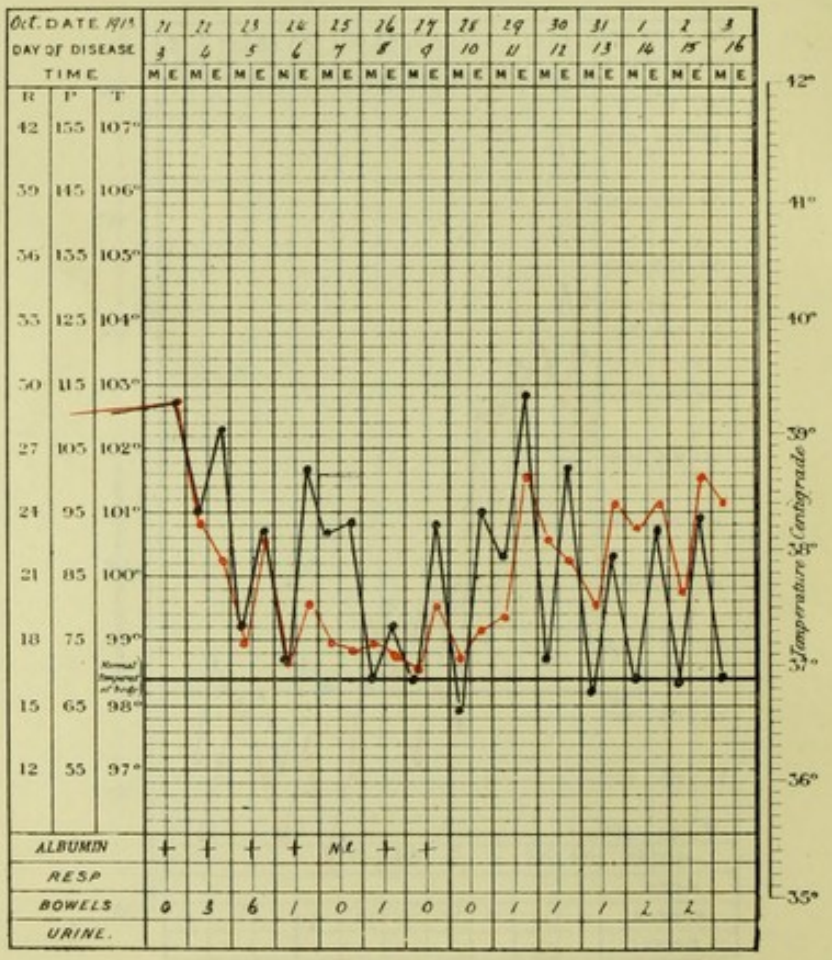


Chart 60

CASE 49. L. 100†

Race: Negro.
Age: 24.
Sex: Male.
Occupation: Labourer.
Date of admission to hospital: 26th October, 1913.
Date of discharge: 13th November, 1913.

Living in Kroo House, Messrs. Elder Dempster's beach, in infected area. Was well on 25th October at one o'clock, had headache during the night and at one o'clock p.m., 26th, was found at inspection to have a temperature of 103°, with thick deposit of albumen in urine. He was isolated. Eyes were not injected. Tongue red, glazed, some white fur down both sides. Chest negative, except for a few bronchitic râles. Abdomen, no epigastric tenderness. Spleen one inch below the ribs, otherwise no signs.

27th October.—Temperature had risen to 104° last night, but down this morning to 99°. Urine as before.

28th October.—Temperature 99°. Urine as before. Half albumen after standing four hours. Casts found pretty plentifully in centrifugalized specimen —no blood—no pus.

13th November.—Albumen gradually diminished. Merest trace to-day. Patient discharged well.

Paraplasma flavigenum found at Medical Research Institute, Yaba.

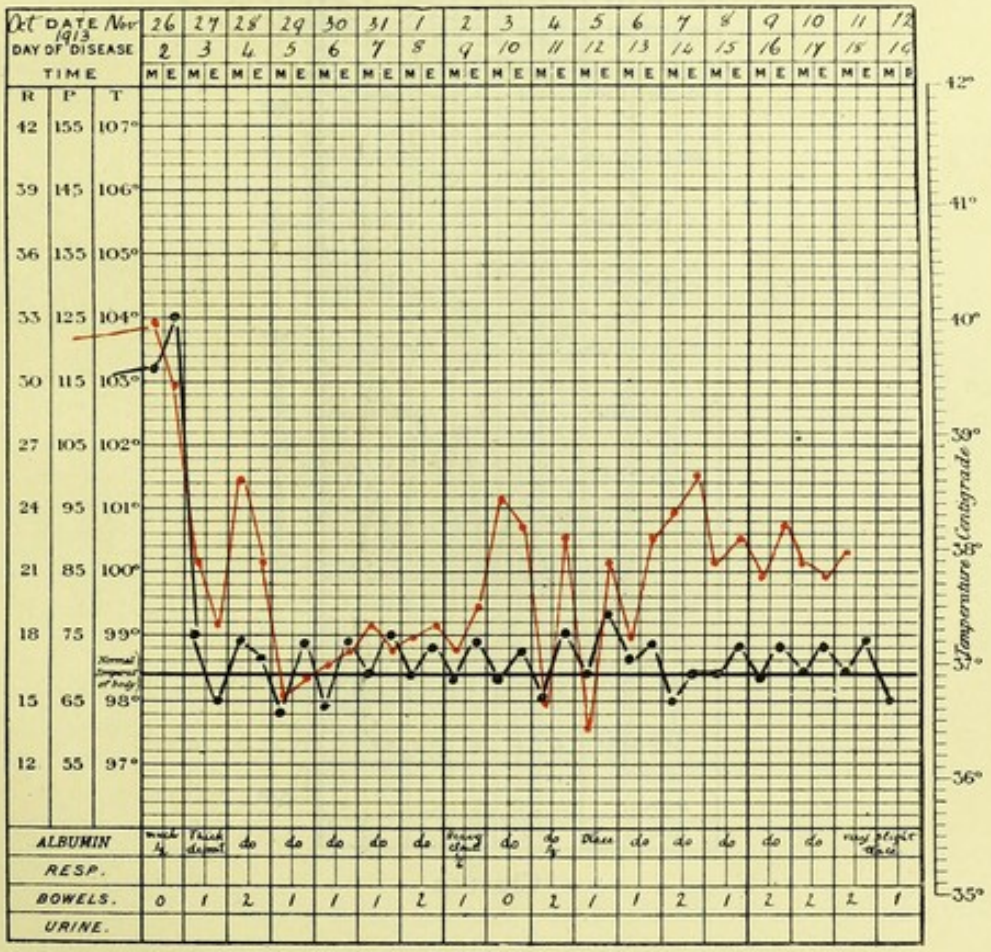


Chart 61

CASE 50. *Commission number not obtainable*

Race: Negro.

Sex: Male.

Age: 25.

Occupation: Prisoner.

Date of admission to hospital: 27th October, 1913.

Date of discharge: 1st November, 1913.

Diagnosis: Bronchitis.

Note.—Paraplasma flavigenum found at Medical Research Institute, Yaba.

History.—Slight fever evening of 26th. Temperature 100° Fahr. Has had fever for three days and been constipated. Is very deaf—history not reliable.

Condition on admission.—Temperature, 99·4° Fahr. Pulse, 82. Has some cough—a cold in the head. Chest, negative. Abdomen, spleen enlarged. Urine, albuminous.

Treatment.—Quinine 10 grains t.d.s.

This patient had been in Forcados Prison since 9th May, 1913.

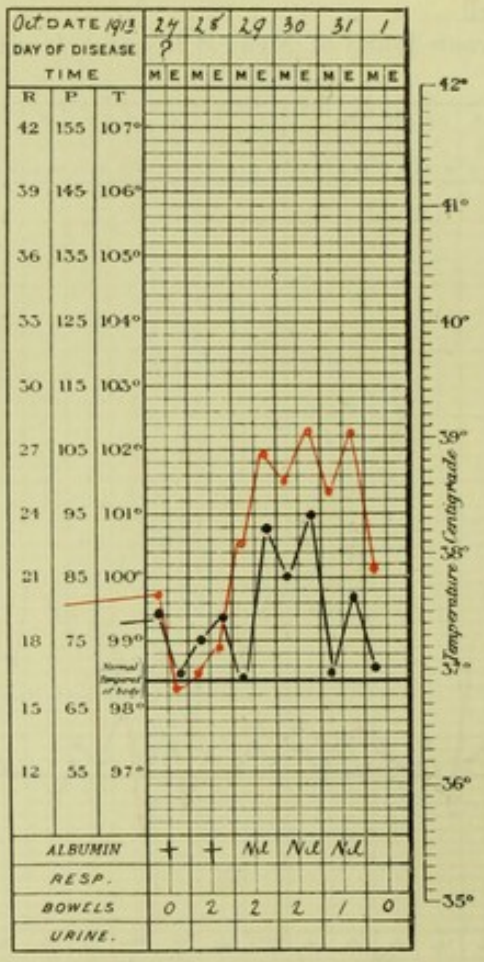


Chart 62

CASE 51. *Commission number not obtainable**

Race : Negro.

Age : 20.

Sex : Male.

Occupation : —

Date of admission to hospital : 14th November, 1913.

Date of discharge : 18th November, 1913.

History.—Admitted for headache, etc. Vomited last night and had pain in abdomen.

Condition on admission.—Temperature, 100·2° Fahr. Pulse, 86. Eyes, distinctly jaundiced. Tongue, clean. Chest, negative. Abdomen, liver palpable ; spleen comes below ribs ; pressure at any point is said to be painful. Urine, high-coloured ; bile ; thick clot of albumen.

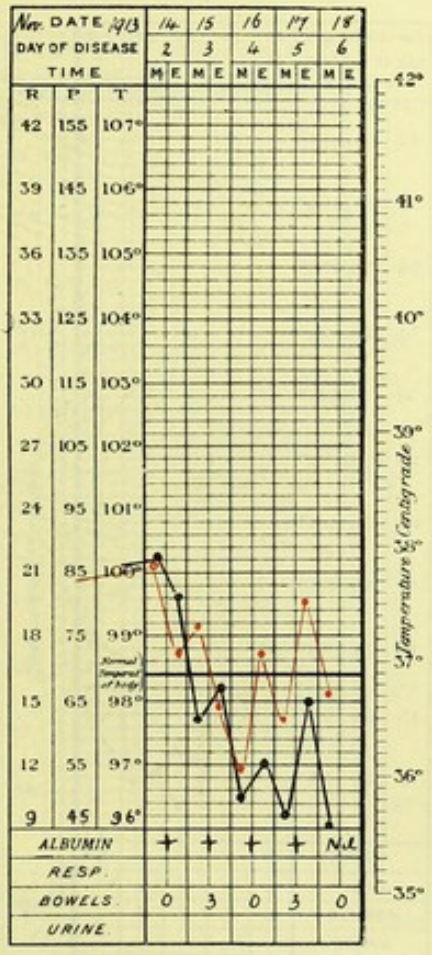


Chart 63

CASE 52. *Commission number not obtainable**

Race: Negro.

Age: 23.

Sex: Male.

Occupation: Labourer.

Date of admission to hospital: 25th November, 1913.

Date of discharge: 29th November, 1913.

History.—The patient on arrival at Forcados by river boat from 'up country' (place of embarkation unknown) was found to have some pyrexia and was accordingly placed under observation.

His condition was as follows.—Abdomen, normal; no enlargement of liver or spleen. Tongue, quite clean. Urine, trace of albumen.

Course.—27th November.—Looked and felt quite well.

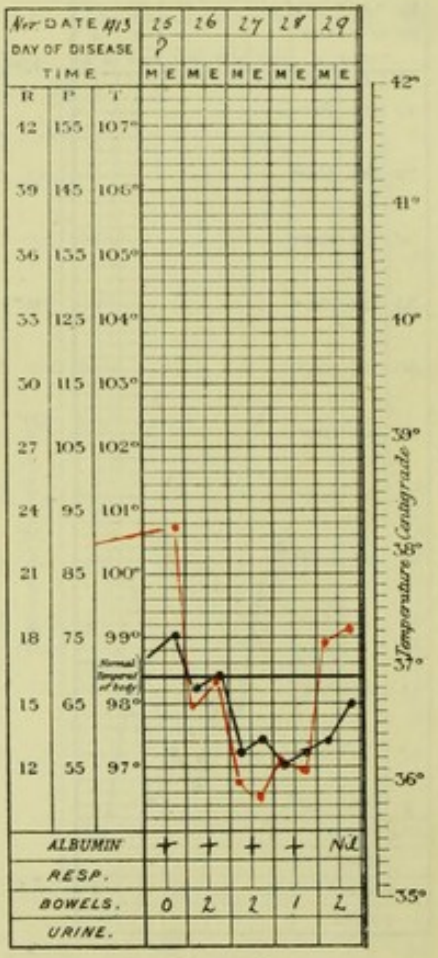


Chart 64

CASE 53. *Commission number not obtainable**

Race: Negro.

Age: 23.

Sex: Male.

Occupation: Labourer.

Date of admission to hospital: 25th November, 1913.

Date of discharge: 29th November, 1913.

History.—The patient on arrival at Forcados by river boat from 'up-country' (place of embarkation unknown) was found to have some pyrexia and was accordingly placed under observation.

Condition on admission.—Temperature, 100·2° Fahr. Pulse, 98. Tongue, clean. Abdomen, normal; slight enlargement of spleen; no jaundice, pain or vomiting. Urine, slight albumen.

Course: 27th November.—Feels quite well.

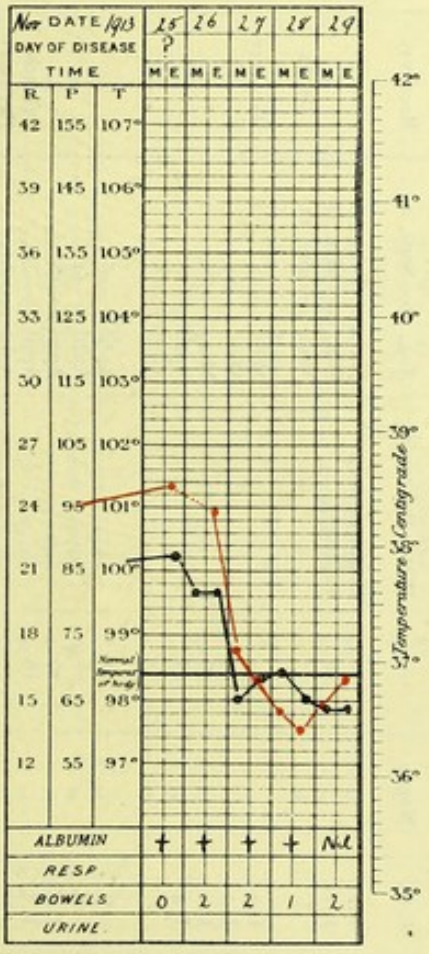


Chart 65

Tabular Statement of the Cases

Place	No. of Case in Report	Commission No.	Race	Approximate Age	Occupation	Date	Result	Quinine Prophylaxis	Blood Examination for Malaria Parasites	Blood Examination for *Paraplasma flavigenum*	Remarks
						1909					
Forcados	1	L.7	European	—	Government official	Oct.; date unknown	Recovery	Not known	No record	—	—
,,	2	L.10	,,	—	,, ,,	Nov. 22—29... ...	,,	,,	,,	—	—
,,	3	L.9	,,	—	,, ,,	Nov. 23—Dec. 1 ...	,,	,,	,,	—	—
,,	4	L.8	,,	—	,, ,,	Nov. 16—21... ...	Death	,,	,,	—	—
						1911					
,,	5	L.6	Negro	—	Water Policeman	Aug. 26—Sept. 4 ...	Recovery	No	Negative	—	—
						1913					
Burutu ...	6	L.11	,,	30	Engineer	Jan. 22—Feb. 13 ...	,,	,,	,,	—	—
,,	7	L.12	,,	26	Labourer	Feb. 19—Mar. 18 ...	,,	,,	,,	—	—
,,	8	†	,,	—	,, ...	Mar. 3—April 11 ...	Death	,,	Not made	—	Otitis Media (? following fever unclassified).
,,	9	L.3	,,	—	,, ...	Mar. 5—13	Recovery	,,	Negative	—	—
,,	10	L.2	,,	29	,, ...	Mar. 4—15	,,	,,	,,	—	—
,,	11	L.1	,,	26	,, ...	Mar. 4—18	,,	,,	,,	—	—
,,	12	L.4	,,	18	,, ...	April 5—16	,,	,,	,,	—	—
,,	13	?	,,	—	,, ...	April 7—16	,,	,,	Not made	—	Pneumonia (? fever unclassified)
,,	14	†	,,	—	,, ...	April 7—16	,,	,,	,,	—	,,
,,	15	†	,,	—	,, ...	April 7—24	,,	,,	,,	—	,,
,,	16	L.13	,,	29	,, ...	April 8—18	,,	,,	Negative	—	—
,,	17	L.5	,,	16	,, ...	April 23—26 ...	Death	,,	,,	—	—
,,	18	?	,,	—	,, ...	April 24—May 2 ...	Recovery	,,	,,	—	—
,,	19	?	,,	—	,, ...	May 8—18	,,	,,	,,	—	—
,,	20	L.60	,,	26	Pauper	July 9—16	,,	,,	,,	—	No albuminuria
,,	21	L.62	,,	29	Labourer	July 31—Aug. 9 ...	,,	,,	,,	Positive	—
Forcados	22	?	,,	—	Fireman	May 5—18	,,	,,	,,	—	—
,,	23	L.61	,,	27	Labourer	July 24—30	,,	,,	,,	—	—
,,	24	L.74	,,	24	,, ...	Aug. 29—Sept. 2 ...	,,	,,	,,	—	—
,,	25	L.80	,,	12	Pauper	Sept. 3—8	,,	,,	,,	—	—
,,	26	L.75	,,	17	Labourer	Sept. 4—9	,,	,,	—	—	—
,,	27	L.76	,,	13	Schoolboy ...	Sept. 5—9	,,	,,	—	—	—
,,	28	L.77	,,	22	Clerk	Sept. 8—11	,,	—	—	—	—

The sign (†) signifies that the notes of the case were not submitted to an Investigator.
The question mark (?) signifies that the Commission number was unobtainable.

Tabular Statement of the Cases—*continued*

Place	No. of Case in Report	Commission No.	Race	Approximate Age	Occupation	Date	Result	Quinine Prophylaxis	Blood Examination for Malaria Parasites	Blood Examination for *Paraplasma flavigenum*	Remarks
						1913					
Forcados	29	L.78	Negro	16	Pauper	Sept. 9—17 ...	Recovery	No	—	—	—
,,	30	L.79	,,	26	Servant	Sept. 12—17 ...	,,	,,	—	—	—
,,	31	L.97	,,	24	Labourer	Sept. 22—30 ...	,,	,,	—	—	—
,,	32	L.96	,,	22	,, ...	Sept. 23—28 ...	,,	,,	—	—	—
,,	33	L.95	,,	23	Engineer	Sept. 25—28 ...	,,	—	—	—	—
,,	34	L.99	,,	24	Clerk	Sept. 26—28 ...	,,	—	—	Positive	—
,,	35	L.94	,,	—	Labourer	Sept. 26—30 ...	,,	No	—	—	—
,,	36	L.98	,,	24	Female pauper ...	Sept. 26—Oct. 3 ...	,,	,,	Positive	—	—
,,	37	L.93	,,	—	Labourer	Sept. 23—26 ...	,,	,,	—	Positive	—
,,	38	L.92	,,	—	—	Oct. 3—7 ...	,,	,,	—	—	No albuminuria Patient treated with quinine
,,	39	†	,,	28	Clerk	Oct. 8—9	,,	—	—	—	The albuminuria was considered to be 'cyclical'
,,	40	?	,,	26	Prisoner	Oct. 9—15	,,	No	—	Positive	Patient treated with quinine
,,	41	?	,,	21	Labourer	Oct. 10—18	,,	,,	—	—	—
,,	42	?	,,	24	Prisoner	Oct. 10—11	,,	,,	—	—	Patient treated with quinine
,,	43	?	,,	28	,, ...	Oct. 11—15	,,	,,	—	Positive	,,
,,	44	?	,,	28	Engineer	Oct. 15—18	,,	,,	—	Negative	—
,,	45	?	,,	34	Clerk	Oct. 15—18	,,	—	—	—	—
,,	46	?	,,	16	Labourer	Oct. 19—27	,,	No	—	Negative	—
,,	47	?	,,	29	,, ...	Oct. 20—29	,,	,,	—	,,	—
,,	48	?	,,	38	Fireman	Oct. 21—Nov. 3 ...	,,	,,	—	Positive	Phthisis pulmonalis was diagnosed in this case
,,	49	L.100	,,	24	Labourer	Oct. 26—Nov. 13 ...	,,	,,	—	,,	—
,,	50	?	,,	25	Prisoner	Oct. 27—Nov. 1 ...	,,	,,	—	,,	—
,,	51	?	,,	20	—	Nov. 14—18... ...	,,	,,	—	—	—
,,	52	?	,,	23	Labourer	Nov. 25—29... ...	,,	,,	—	—	—
,,	53	?	,,	23	,, ...	Nov. 25—29... ...	,,	,,	—	—	—

The sign (†) signifies that the notes of the case were not submitted to an Investigator.
The question mark (?) signifies that the Commission number was unobtainable.

Synopsis of Cases

The onset was gradual in Cases 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 44, 46, 47, 48, 49, 50, 51; unknown in Cases 1, 5, 8, 14, 15, 16, 17, 18, 24, 40, 42, 43, 45, 52, 53.

The fever.—Faget's sign* was present in Cases 36 and 43. Its presence was doubtful in Cases 23, 24, 32, 35, 37, 46, 47. The fever, as shown in the temperature charts, may be classified into two main types:—(*a*) Descending; (*b*) Remitting.

(*a*) Descending type.—Cases 5, 7, 13, 14, 18, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 37, 38, 40, 41, 43, 46, 47, 49, 51, 53.

(*b*) Remitting type.—Cases 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 15, 16, 19, 20, 21, 31, 48, 50.

In the following cases insufficient data make classification impossible.—Cases 17, 33, 34, 35, 36, 39, 42, 44, 45, 52.

The face was described as 'fallen in' in Case 8.

The eyes were injected, or slightly injected, in Cases 5, 10, 11, 12, 18, 24, 28, 32, 38, 42, 43; doubtfully injected in Case 35; not injected in Cases 9, 21, 22, 23, 26, 27, 29, 30, 31, 33, 34, 36, 37, 40, 41, 46, 47, 49; 'not the least injected' in Case 39. The eyes were painful with (?) slight injection in Case 35; 'puffy' in Case 17, 'heavy-eyed' in Case 25. They were jaundiced in Cases 13, 51; 'rather yellower than usually seen' in Case 48. Jaundice is noted to be absent in Cases 2, 3, 5, 6, 7, 10, 17, 22.

(Dr. Bailey remarks in his cover to half-yearly return of suspicious cases 1913.—'Jaundice in slight degrees was not accepted, as it is almost the rule in healthy persons.')

The pupils.—

The skin.—A rash is noted in Cases 2, 3 (these patients were Europeans).

The Nervous System

Cerebral symptoms.—Prostration is noted in Cases 2, 5, 6, 7, 13, 14; delirium in Case 4 on second day, but usually quiet and apathetic in Case 17; mania and convulsions at the end in Case 4.

* The definition of this sign was taken to be as follows:—A want of co-ordination between pulse-rate and temperature showing a falling pulse-rate with a rising or horizontal temperature curve.

Disorders of sensation.—Deafness (no quinine given) was marked in Cases 10, 11; slight in Case 12; so severe as to be useless for any history, but cleared up later, in Case 16. Case 50 is noted as being very deaf on admission. Case 17 was 'admitted in a sleepy state.'

Pain.—Headache is noted in Cases 4, 23, 26, 27, 31, 32, 34, 35, 36, 37, 41, 45, 47, 49, 51. Pain is noted in the eyes in Cases 35, 44; in the chest in Case 23; in the right axilla, due to cough, in Case 48; over the sternum in Case 20; in the abdomen in Case 27—said to be painful all over, but not tender on pressure—also in the abdomen in Case 51—pressure at any point said to be painful; in the epigastrium in Case 31; about the shoulders and other joints in Case 7; in the soles of the feet—severe burning—in Case 6; in joints, previous to admission, in Cases 31, 36, 'all over the body' previous to admission, on admission all over neck, back and arms, in Case 9; in the limbs in Case 15; in the left side in Case 44; in the back in Cases 2 (violent), 3, 15, 37 (over top of sacrum), 47 (in lumbar region). Tenderness over the liver is noted in Cases 5, 6, 12. Epigastric tenderness is noted to be absent in Case 49.

Digestive System

The mouth.—Foetor of the breath was present in Cases 10, 35, 37; the mouth was 'dirty' in Case 20.

The tongue.—Was furred in Cases 2, 3, 5, 7, 10, 16, 18, 19, 21, 35, 37; clean in Cases 23, 24, 28, 29, 30, 31, 40, 42, 51, 52, 53; fairly clean in Cases 9, 33, 34, 36, 43, 46, 47; clean at the edges in Cases 11, 12, 20, 25, 26, 27, 32; red, glazed, some white fur down both sides in Case 49; pale and indented in Case 41; slightly tremulous in Case 31; indented in Case 35; there was yellow fur, said to be habitual, on dorsum in Case 39.

The stomach.—Slight bilious vomiting is noted in Cases 2, 3, 4 (Europeans). Bilious vomiting is noted in Case 47 (native). Absence of vomiting is noted in Cases 5, 6, 7, 9, 10, 17, 22. There had been sea-sickness previous to admission in Case 39. There had been vomiting on the night preceding admission in Case 51.

The liver.—Was enlarged in Cases 5, 6, 12, 17, 27; tender in Cases 5, 6, 12; slightly tender, not enlarged, in Case 44; palpable in Cases 18, 19, 22, 23, 36, 51; on very deep expiration in Case 39;

'hardened' in Cases 18, 19; not enlarged or tender in Cases 9, 10, 11, 13, 20, 23, 24, 25, 26, 28, 30, 31, 32, 34, 35, not enlarged in Case 52.

The stools.—Constipation is noted in Cases 19, 50. The stools are noted to be normal in Case 9.

Renal System

The urine.—As already mentioned, the measurements given of the total quantity of urine excreted are probably inaccurate, and they are, therefore, not quoted here. The renal crisis which occurred in Case 11 is, however, authentic. Albuminuria was present in all Cases except Nos. 1, 2, 3, 4, 20, 37. Casts were found in Case 49. Bile was present in Case 51.

Respiratory System

The chest was noted to be 'filled up' in Case 8. The respirations were noted as 'hurried, about 45, a few bronchitic sounds in the lungs,' in Case 11; as 'rapid; no cough' in Case 47. Pneumonia was present in Cases 13 (apical), 14 (apical), 15 (basal). There were 'slight bronchitic sounds' in Case 23, 'a few bronchitic râles' in Case 49; 'some crepitations with slight cough, no dullness' in Case 29; slight cough in Case 31; 'some crepitations at right base, no cough acknowledged or heard' in Case 35. A diagnosis of phthisis was made in Case 48. The nose was noted as 'snuffling' in Case 47.

The Circulatory System and Ductless Glands

The heart.—A slight systolic murmur at the apex, not conducted, is noted in Case 37.

The pulse (see also Faget's sign, under fever) was slow in proportion to the temperature in Cases 3, 5, 10, 11, 16, 20, 21, 22, 23, 38, 43; slow during convalescence in Cases 2, 3, 5, 7, 8, 9, 11, 13, 14, 18, 19, 21, 22, 25, 26, 27, 28, 29, 30, 32, 34, 35, 53; rapid, out of proportion to the temperature, in Cases 17, 36.

The spleen was noted to be 'hard' in Case 8; tender in Cases 43, 44; not tender in Case 8; enlarged in Cases 8, 9, 12, 16, 17, 19, 21, 26, 27, 29, 43, 44, 49, 50, 51, 53.

NOTES OF THE MOVEMENTS PREVIOUS TO ILLNESS OF CASES 6, 20, 21, 25, 28, 31, 35, 39, 43, 46, 47, 48, 52, 53, the only patients of the 1913 series who are known to have been away from Forcados or Burutu shortly before admission to hospital.

Case 6.—This patient was an engineer on one of the Niger Company's 'stern-wheelers,' plying between Forcados (Burutu) and Baro (Northern Nigeria), and touching at various intermediate ports. The journey from Forcados to Onitsha occupies about two days. Between Onitsha and Baro the patient began to suffer from 'fever,' and another engineer on the vessel was also sick with (apparently, according to the patient) the same kind of 'fever.' This other man deserted during the return voyage, but the patient presented himself for treatment at Forcados upon his return, giving a history of three weeks' illness.

Case 20.—This patient lived in the native town of Okorodudu, about one quarter mile from Burutu, and was employed on the Government 'beach' at the latter place.

Case 21.—This patient was one of the crew of the launch 'Sandbeek.' On the 13th July the vessel left Burutu for Onitsha and arrived again at Burutu on the 23rd July. He was admitted to hospital on the 31st July on (?) the fourth day of the illness. As the launch had meanwhile sailed again to Onitsha the Medical Officer at that place was communicated with by telegraph and reported that there were no others sick on board, nor was any case of sickness found to have occurred upon her return to Burutu. The patient's residence at Burutu was unknown.

Case 25.—This patient came from Gwangaw, near Warri, but, on admission, had been in Forcados for two weeks.

Case 28.—This patient had been on board the mail-boat 'Karina' at Forcados and Burutu for one week. He then went ashore (about the 5th September) and lived near to where Cases 25, 26, and 27 occurred. These cases were admitted to hospital on the 3rd, 4th, and 5th September respectively. He was admitted on the 8th September—the third day of the disease. The 'Karina' had arrived at Forcados on 30th August, having come from Liverpool. She had anchored in the harbour at Sierra Leone; at other West

Coast ports she lay in the roads; numerous deck passengers (natives) were carried between Sierra Leone and Forcados.

There were no suspicious cases on the vessel either before or subsequently to this case so far as I have been able to ascertain.

It is, of course, very possible that the patient went ashore during his week's sojourn on the ship at Forcados and Burutu, notwithstanding his statement to the contrary. At Forcados the vessel was anchored in the river, but at Burutu she was moored to the wharf.

Case 31.—This patient was one of the crew of the dredger 'Egerton,' which arrived at Forcados on 30th August, having left Lagos while that town was in quarantine for yellow fever. She was fumigated on arrival, after which the patient lived on board for one week, *i.e.*, until the 6th September. He then lived ashore (see 'spot' map of Forcados). He was admitted to hospital on the 22nd September—the fourth day of his illness.

Case 35.—This patient was a fireman on the station-launch 'Aro,' on which he would frequently be at work after nightfall. He had lived at Chikoko Beach (see 'spot' map of Forcados) for three years, in a 'bush' house.

Case 39.—This patient had arrived at Forcados from Lagos by the s.s. 'Niger' on the day preceding his admission to hospital. Lagos was at this time (October) in quarantine. (See Section III, Case 21.)

Case 43.—This patient was a prisoner who was being transferred from Onitsha to Lagos Gaol, and was temporarily lodged in Forcados Prison. At the time of his illness he would not have been in Forcados more than four days. He may have become infected either on the river-boat between Onitsha and Forcados or (as the journey occupies only two days) at Onitsha. The fact that three other cases—Nos. 40, 42, and 50—occurred in the prison at Forcados about the same date is, however, suggestive. There had been no suspicious cases among the prisoners at Onitsha.

Cases 46, 47, and 48 were taken off three different vessels that had come from Lagos while that town was in quarantine. (See Section III, Cases 22, 23, and 24.)

Cases 52, 53 had arrived at Forcados by river launch from 'up-country'—place of embarkation unknown.

It will be seen that, of the above cases, Nos. 6, 20, 21, 25, 28, 31, 35, 43, may have become infected ashore at Forcados or Burutu.

Clinical Note

The remarks by Dr. Bailey (see above), refer to the clinical features of those cases which occurred before June, 1913. They are equally applicable, with certain exceptions that are apparent, to those which were treated after June, and it would hence be superfluous for me to discuss the cases further.

I, therefore, refer here only to Cases 14 and 15, which occurred in April, and were not included in Dr. Bailey's January to June series.

Both presented pneumonic signs, which, it may be remarked, were also present in patient No. 13.

Case 14.—The persistence of 'much' albumen in the urine for four days after the temperature had fallen to normal is interesting. Was there in this case, perhaps, a double infection (pneumonia and yellow fever)? As already stated, the record of respirations, made by a native attendant, is untrustworthy.

Case 15.—The pains in the limbs and back are suggestive, as also is the fact that three other cases (Nos. 10, 11, 12) had been admitted to hospital from the same house in which the patient lived at Burutu (see 'spot' map) on 4th March, 4th March and 5th April respectively. The patient was (as also were Cases 13, 14) admitted to hospital on 7th April. The pneumonic signs in Cases 13, 14 were apical; in Case 15 they were basal.

Epidemiological Note

The similarity of the clinical characters in the majority of the 1913 cases, taken together with their chronological and topographical features, appears to leave little room for doubt as to their infective nature.

With the possible exception of Cases 1, 2, 3, 37, 38 (all without albuminuria), it appears improbable that they were either dengue or seven-day fever.

No exceptional development of *Stegomyia* was associated with any of the cases except Nos. 10, 11, 12, 15, which occurred in the same house at Burutu. The first three of these are fairly typical of the whole series.

This association with an unusual number of *Stegomyia*, while it is no actual proof, is, of course, very suggestive of their specific nature.

If these cases and the similar ones which have occurred at Lagos were not yellow fever in a modified form, it would be necessary to invoke the 'long arm of coincidence' in order to explain their occurrence during the same period as well-marked cases of the disease in Europeans and Syrians in Lagos, Warri, Abeokuta, and on certain ocean-going vessels. And in this connexion it may be remarked that the occurrence of the Forcados and Burutu cases, with the exception of Nos. 46, 47, 48, 52, 53, was in no way an artificial or misleading occurrence in the sense that the patients were persons examined in the course of quarantine work, who would have otherwise escaped detection. On the contrary, all the Forcados and Burutu cases, with the exceptions stated, voluntarily applied for treatment. The cases, excluding those of 1909 and 1911, fall into two groups: (i) the Burutu cases, which occurred between January and July; (ii) the Forcados cases, which occurred from May to November.

(i) Burutu cases.—These were 16 in number. One case occurred in January, one in February, four in March, seven in April, one in May, and two in July.

None had, as far as could be ascertained, been away from Burutu for some weeks previous to the illness, with the exception of Nos. 6, 20, and 21, whose movements have already been considered in detail.

Cases 10, 11, 12, 15 lived in the same house (25 per cent. of all the Burutu cases); they were admitted to hospital respectively on 4th March, 4th March, 5th April and 7th April.

Cases 9 and 13 lived within approximately 60 yards of one another, and within approximately 160 yards of Cases 10, 11, 12, 15.

Cases 9 and 13 were admitted to hospital respectively on 5th March and 7th April. The residence of Cases 6, 8, 14, 16, 18, 19, 21 is unknown.

(ii) Forcados cases.—These were 32 in number. One case occurred in May, none in June, one in July, one in August, thirteen in September, thirteen in October, and three in November. None had, as far as could be ascertained, been away from Forcados for some weeks previous to their illness, with the exception of Cases 25, 28, 31, 35, 39, 43, 46, 47, 48, 52 and 53, whose movements have already been considered in detail.

Cases 22, 25, 26, 27, 28, 33, 34, 36, 38, 41, 45 occurred in one definite area (see 'spot' map). They were admitted to hospital on the following dates:—

Case	22	5th May.
,,	25	3rd September.
,,	26	4th ,,
,,	27	5th ,,
,,	28	8th ,,
,,	33	25th ,,
,,	34	25th ,,
,,	36	26th ,,
,,	38	3rd October.
,,	41	10th ,,
,,	45	15th ,,

Cases 25 and 28 were probably infected in Forcados, though they had been away from the port within a short period of their illness.

Cases 29, 31, 32, 49 occurred in Messrs. Elder Dempster and Company's compound on respectively 9th September, 22nd September, 23rd September, 26th October.

The residence of Cases 44 and 51 is unknown. Of the four cases 40, 42, 43, 50, which occurred in the prison, three appear to be of special interest.

The four cases occurred respectively on 9th, 10th, 11th, and 27th October. They had been lodged in Forcados Gaol, respectively, eight months, six months, not exceeding four days, five months. It will be convenient to set out these facts in tabular form:—

Case No.	Date of Admission to Hospital	Length of Previous Incarceration
40	9th October	8 months
42	10th October	6 months
43	11th October	Not exceeding 4 days
50	27th October	5 months

Leaving out of consideration Case 43, who had been brought from Onitsha and may have become infected there or *en route* (as

already mentioned the journey from Onitsha to Forcados occupies two days), it is difficult to understand how, under the efficient sanitary conditions of Forcados gaol, the remaining three prisoners could have become infected. As will be seen from the attached plan of the town, the prison is situated in a very sparsely populated area, and some distance away from dwellings, with the exception of the jailor's, warders' and gang-drivers' houses. These I had thoroughly inspected shortly *before* the cases occurred (within a week of Cases 40, 42, and within three weeks of Case 50), and found to be well kept and quite free from larvae. Moreover, the prevailing wind blows *from* the prison *towards* the native quarter.

Prisoners are, of course, kept within the gaol from sunset to sunrise.

Assuming that yellow fever is produced by a protozoic organism, is it possible that, as in malaria, it may remain latent in the body until, stimulated into activity by some debilitating influence acting upon the host, there is a resulting exhibition of symptoms?

It would follow that an attack of yellow fever in a native need not, any more than an attack of malarial fever, connote a recent infection.

Such a view in regard to Europeans, it may be urged, would be untenable on the ground that yellow fever is not known except in traceable association with *Stegomyia fasciata*, and that if it were true, exacerbations of the disease would occur, as in the case of malaria, in regions where the insect carrier is unknown. In reply to this argument it might be said that such exacerbations in cold climates possibly do occur, being mistaken for malaria.

A European harbouring the yellow fever organism, and, therefore, perhaps, partially immunized, would conceivably develop atypical symptoms, the significance of which would escape recognition.

Typical attacks of yellow fever, analogous to those occurring in malaria, long after infection, need perhaps (in the present state of knowledge of immunity in its relation to protozoal diseases) not be assumed necessarily to occur.

As far as I am aware, the hypothesis here enunciated has not hitherto been suggested. I make it with all diffidence, and because

it is, of course, desirable to draw attention to a possibility the establishment of which as a fact would greatly modify the existing aspects of the disease.

Incidentally, the localization of the Forcados cases, whilst it is corroborative evidence of their nature, illustrates the desirability of European segregation. Eleven out of a total of thirty-two (34 per cent.) were grouped in one definite area (see map); four (12·5 per cent.) in another. Four cases occurred in the prison—one of these was possibly imported. The remaining cases were scattered, as also were those at Burutu, with the exception of four (25 per cent.), which occurred in the same house. In the absence of segregation, the risk, not only of infection of Europeans, but also of reinfection of natives with an organism of enhanced virulence, was very considerable. Doubtless anti-mosquito measures to the extent of totally exterminating *Stegomyia* would commend themselves to such as regard European segregation with disfavour, but those who have had practical experience of anti-mosquito measures in this Colony, while admitting the great importance of mosquito destruction, know well that a counsel implying total destruction is a counsel of perfection.

This is not the place to enter into a discussion of the relative merits of mosquito extermination and of race segregation, but whilst dealing with the Forcados and Burutu outbreak it appears desirable to point out, in relation to those ports, that the constant ingress and egress of launches and 'stern-wheelers,' in which *Stegomyiae* develop freely and may be transported from place to place, and of canoes in which there is frequently standing water, not to mention the frequent arrival and departure of ocean-going vessels, would render a scheme of prophylaxis against yellow fever, in regard to these towns, which did not include European segregation probably futile and certainly very unreliable.

VI. *Conditions as regard* Stegomyia *Breeding in Forcados and Burutu*

Stegomyia fasciata is present at both Forcados and Burutu.

The native houses in those towns are disposed on a definite plan. They stand, for the most part, in rows, are therefore easily

inspected, and only a small proportion of them have compounds (inclosures), in which, in other towns, one so frequently finds collections of standing water and agglomerations of garbage. It is to be remarked, however, that in some parts of Forcados, notably in the area where Cases 22, 33, 36, 38, 41 occurred, the sanitary conditions were deplorable, and due entirely, I was informed, to the want of financial means to carry out some most essential and even elementary improvements. I inspected both Forcados and Burutu, in which the conditions as regards *Stegomyia* breeding are similar, and the following statistics represent the sum of my observations in both places, made before any exceptional anti-mosquito measures had been taken.

Out of 115 houses taken at random in different parts of the towns, including those in which the cases described occurred, no water at all was found in 32, while in four larvae were found. These larvae, on being hatched out, proved to be *Stegomyia fasciata*.

My inspection, it should be remarked, was made at the termination of the rainy season, when the water supply is sufficient and there is no temptation to store it unduly inside the houses. The conditions which obtain in the dry season may possibly be less favourable, for, at that period of the year, I am informed, there is often a considerable shortage of water, which has then to be brought a long distance by river and economized as much as possible. This shortage, I am further informed, is due to the inadequate supply of rain-water tanks. I learned from the Medical Officer that the outbreak of four cases (Nos. 10, 11, 12, 15) in one house at Burutu was ascribable to the breeding of large numbers of *S. fasciata* in some barrels of water in the compound which had been overlooked by the Sanitary Inspector.

Out of fifteen wells I found that six were safely screened; in one the mosquito gauze was in disrepair; in one (upon private ground) no attempt at screening had been made, in one (upon Government property) *Stegomyia* larvae had been found according to the Sanitary Inspector. This well was unscreened and had since been oiled.

I examined 37 rain-water tanks. Of these 29 were effectively screened. In eight the gauze was defective. Out of 34 barrels

used for the storage of water, 15 were effectively screened, there was a defect in the gauze in 11, whilst 8 were open.

In seven roof-gutters there was some standing water. In none of the wells, tanks, barrels, or roof-gutters, whether screened or not, did I find any larvae whatever. The mosquito-index in Forcados, based on the observations of native sanitary inspectors in April, May, and June, 1913 (wet months), was 0·61, 0·46, 0·55, respectively.

In December, 1912, and January and February, 1913 (dry months), it was 0·27, 0·61, 1·06, respectively.

I inspected both the native villages, the nearest of which, as already stated, is about one furlong from a European residence (non-official).

These villages are situated amidst unreclaimed swamp. The huts, which, even in the dry season are practically surrounded by water, are built of reeds and are raised, some upon piles, others upon platforms of earth. They are connected with one another and with the town by raised paths which slope down to the water on either side through a zone of black mud. The picture presented is that of a diminutive, primitive, and infinitely hideous and squalid Venice. The water is, for the most part, tidal, and I found no larvae therein, but there are numerous ponds and pools where earth has been excavated to form platforms for houses. These are only reached by high tides, and in some (but in only one of the villages) I found an abundance of mosquito larvae.

Dr. Laurie, the Junior Sanitary Officer, had, I was informed, found some of these larvae to be *Stegomyia fasciata*, but though I collected and bred out a large number, none of them proved to belong to this species. His observation is, of course, of the highest importance as indicating a probable source of supply of this insect to Forcados port.

I obtained some of the water from the pond in question for analysis by the Government chemist, Mr. Ralston, in order that the degree of its salinity might be ascertained. He reported that the chlorides present were equivalent to 4·74 per cent. of common salt, and he informed me that, in a series of experiments carried out by him in 1904, he found that in water containing under 1 per cent. common salt mosquito larvae developed freely.

In consequence of the vigorous house inspection that had taken place in these villages, and the strict injunctions issued to the inhabitants concerning water storage prior to my visit, further examination would not have yielded any useful results.

Twenty houses, taken at random, contained no larvae; indeed, in a considerable proportion of these no water whatever was stored.

From consideration of the foregoing facts it would appear that the river craft, and perhaps also, as regards Forcados, the native villages, constitute the principal source of supply of *S. fasciata* in Forcados and Burutu.* As is well known, the insect breeds freely in the bilge water of river boats. Shallow, transverse steel girders, projecting a variable distance inwards from the inner surface, divide the hulls into compartments that form ideal pools for *Stegomyia* propagation. In the transomes and chain-lockers these pools are particularly difficult of access.

I inspected one 'stern-wheeler' and two launches, and in all three *Stegomyia* were numerous.

It may here be remarked that cases 6, 21, 35, were employed on river craft. This would necessitate their frequent presence on board at night. Case 31, though employed on ship-board, was probably infected ashore.

VII.—*Movements of Population suggesting possible Transmission of Virus*

There is a considerable traffic affecting Forcados and Burutu—almost entirely by river and sea. As has been stated, ocean-going steamers are able to enter the Forcados River, where an interchange of cargo and passengers may take place with smaller steamers (branch boats) and river-craft of various kinds, all of which go alongside the larger vessel as she lies in mid-stream. Occasionally these ocean-going ships moor at the wharf. Some proceed to Burutu, where they invariably go alongside the wharf.

In addition to these ocean-going ships there is a considerable traffic as follows:—

---

* Mosquitoes have also been found to breed in the numerous tortuous burrows of crabs. These may perhaps be a not inconsiderable source of *Stegomyia*, especially in the dry season, when they are not, as in the wet season, subject to constant flushing. The level of the subsoil water at Forcados to which the burrows may extend is within one or two feet of the surface.

1. By Government craft:
   (*a*) 'Stern-wheeler' on the Niger River—weekly—to and from Northern Nigeria. The journey may occupy many days.
   (*b*) Launch to and from Warri—bi-weekly; journey approximately four hours, often accomplished after sunset.
   (*c*) Launch to and from Sapele—weekly journey approximately ten hours, often accomplished after sunset.
2. By numerous passenger-carrying vessels owned by mercantile firms.
3. By canoe.

It will be evident from consideration of the above facts that the facilities for rapid transit, not only of passengers, but also of *Stegomyiae*, are considerable. The following are some statistics referring to the months of June, July, and August, 1913, illustrating the very large movements of population. They have reference only to craft owned by Government, by Messrs. The Niger Company, and by Messrs. Elder Dempster and Company. There are several other firms owning passenger-carrying vessels. Neither the traffic upon these nor the canoe traffic is included, and the figures do not purport to be, therefore, a complete statistical return of river traffic affecting the ports of Forcados and Burutu.

Statistics Illustrating Movements of Population affecting Forcados and Burutu in June, July and August, 1913.*

From	To	European	Native	Craft
Burutu ...	Up-river ports	33	417	Government
Up-river ports	Burutu	68	700 (approximate)	,,
Forcados ...	Up-river ports	13	180	,,
,, ...	Sapele, Koko, Burutu, Warri ...	28	1,155	,,
Warri	Burutu, Forcados, Koko, Sapele	54	1,883	,,
Sapele	Koko, Forcados, Warri	26	527	,,
Koko	Sapele, Forcados, Warri ...	3	142	,,
Burutu ...	Up-river ports	80	721	Niger Company
Up-river ports	Burutu	30	388	,,
Forcados ...	Lagos	—	392	Elder Dempster & Co.
,, ...	Accra	—	128	,,
,, ...	Cape Coast Castle	—	34	,,
,, ...	Sekondi	—	27	,,
,, ...	Cape Palmas	—	4	,,
,, ...	Sierra Leone	—	45	,,
,, ...	Bonny	—	15	,,
,, ...	Calabar	—	35	,,

* The figures represent the totals for three months

Section III

Introduction.—This section deals with thirty-three cases of fever which occurred on ocean-going vessels and dredgers in 1912 and 1913.

Twelve of these cases were definitely diagnosed as yellow fever; the remaining twenty-one were not so diagnosed, but are included here because, while some of them are characterized merely by certain suggestive features, others are undoubtedly highly suspicious.

Reference has already been made to several of these cases in more or less detail in other sections of this report and in my Report No. 1, but it will be convenient to group them all together in this section.

It should be remarked that, in some instances, it has not been possible at the time of my investigation to ascertain the precise movements of the patients and ships under consideration, but that the information, whenever available, has been rendered in detail.

A tabulated statement of the cases, arranged in chronological order, will be found on page 157.

The clinical and epidemiological features of cases 15, 16, 17, 18, 19 (which occurred at Warri) have been fully dealt with in Section I, and will accordingly not be further referred to except in my concluding paragraph. The remaining cases are conveniently divided into two groups (A) and (B).

Group (A) includes cases 1, 2, 3, 4, 5, 9, 10, 11. Their clinical features have been described and discussed in Report No. 1, paragraph VIII (which see), but for convenience of reference are recapitulated here, while their epidemiological characters are also now dealt with. A note regarding quinine treatment, together with temperature charts of each case, inadvertently omitted from Report No. 1, is now included. Cases 1, 2, 3, 5, 9, 10 correspond respectively to cases, 3, 5, 6, 7, 9, 10 in Table 3, paragraph VIII, Report No. 1. All the cases in this group, with the exception of No. 4 (this patient died in Lagos Roads), occurred on ships in the harbour and were treated in Lagos Hospital.

Group (B) includes cases 6, 7, 8, 12, 13, 14, 20 to 33, which have not been dealt with in other sections. Case 12, which occurred in May, should have been included in Report No. 1, paragraph VIII, but was accidentally omitted.

No. of Case in Report	Commission No.	Date	Name of Vessel	Diagnosis	Result	Remarks
1	†	February, 1912	s.s. 'Mayumba' ...	Malarial fever	Recovery	European: Treated in Lagos Hospital
2	†	November, 1912	s.s. 'Lokoja'	Malarial fever	Recovery	European: Treated in Lagos Hospital
3	†	December, 1912	'Sandgrouse,' dredger	Malarial fever	Recovery	European: Treated in Lagos Hospital
4	†	December, 1912	s.s. 'Shonga'	Hyperpyrexia, no doubt due to malarial fever	Death	European: Died on shipboard in Lagos Roads
5	†	December, 1912	—	Malarial fever	Recovery	European: Treated in Lagos Hospital
6	†	January, 1913 ...	s.s. 'Patani'	Malaria and hyperpyrexia ...	Death	European: Died on shipboard at Sapele
7	†	January, 1913 ...	s.s. 'Oshogbo' ...	Hyperpyrexia	Death	European: Died on shipboard at Forcados
8	†	January, 1913 ...	s.s. 'Adansi'	Yellow fever	Death	European: Died on shipboard at Saltpond, Gold Coast
9	†	March, 1913 ...	'Sandgrouse,' dredger	Malarial fever	Recovery	European: Treated in Lagos Hospital
10	†	March, 1913 ...	s.s. 'Lagoon'	Malarial fever	Recovery	European: Treated in Lagos Hospital
11	L.22	May, 1913 ...	s.s. 'Gouverneur von Puttkammer'	Malaria and uraemia	Death	European: Died in Lagos Hospital
12	L.36	May, 1913 ...	s.s. 'Epe'	Yellow fever and malarial fever	Recovery	European: Treated in Lagos Hospital
13	L.46	July, 1913 ...	s.s. 'Delta'	Yellow fever	Recovery	Native: Treated in Lagos Hospital
14	L.53	August, 1913 ...	s.s. 'Ivy'	Yellow fever	Recovery	Native: Treated in Lagos Hospital
15	†	August, 1913 ...	s.s. 'Lulu Bohlen' ...	Fracture of skull	Death	European: Died on shipboard at Koko
16	†	September, 1913	s.s. 'Lulu Bohlen' ...	Malaria and albuminuria ...	Recovery	European: Treated in Warri Hospital
17	L.66	September, 1913	s.s. 'Thomas Holt' ...	Malaria and albuminuria ...	Recovery	European: Treated in Warri Hospital
18	L.67	September, 1913	s.s. 'Thomas Holt' ...	Malaria and albuminuria ...	Recovery	European: Treated in Warri Hospital
19	L.68	September, 1913	s.s. 'Thomas Holt' ...	Malaria and albuminuria ...	Recovery	European: Treated in Warri Hospital
20	L.113	October, 1913 ...	s.s. 'Zaria'	Yellow fever	Death	European: Died on shipboard at Forcados
21	†	October, 1913 ...	s.s. 'Niger'	Cyclical albuminuria	Recovery	Native: Treated in Forcados Hospital
22	?	October, 1913 ...	s.s. 'Effo'	—	Recovery	Native: Treated in Forcados Hospital
23	?	October, 1913 ...	s.s. 'Abonnema' ...	—	Recovery	Native: Treated in Forcados Hospital
24	?	October, 1913 ...	s.s. 'Iddo'	Phthisis	Recovery	Native: Treated in Forcados Hospital
25	†	October, 1913 ...	s.s. 'Elmina'	Hyperpyrexia occurring during an attack of malaria	Death	European: Died on shipboard between Forcados and Lagos
26	L.129	October, 1913 ...	s.s. 'Monrovia' ...	Yellow fever	Recovery	European: Treated in Calabar Hospital
27	L.102	October, 1913 ...	s.s. 'Elizabeth Brock'	Yellow fever	Death	European: Died on shipboard at Lagos
28	L.103	October, 1913 ...	s.s. 'Elizabeth Brock'	Yellow fever	Recovery	European: Treated in Lagos Hospital
29	L.104	October, 1913 ...	s.s. 'Elizabeth Brock'	Yellow fever	Recovery	European: Treated in Lagos Hospital
30	L.105	November, 1913	s.s. 'Bassa'	Yellow fever	Death	European: Died in Lagos Hospital
31	?	December, 1913	—	Malignant malaria	Death	European: Died at Port Harcourt
32	L.107	December, 1913	s.s. 'Montenegro' ...	Yellow fever	Death	European: Died on launch which was conveying him to Lagos Hospital
33	L.119	December, 1913	s.s. 'Nyanga'	Yellow fever	Death	European: Died on shipboard in Lagos Roads

The sign (†) signifies that the notes of the case were not submitted to an Investigator.
The question mark (?) signifies that the Commission number was unobtainable.

Group A

Case 1

(i) *Summary of Clinical Features:—*

Age: 28.
Sex: Male.
Race: European.
Occupation: Seaman.
Date of admission to Lagos Hospital: February, 1912.
Diagnosis: Malarial fever.
Result: Recovery.
Number of days in hospital: Five.
Urine: S.G. 1020. Albumen present.
Blood: No record.
Quinine treatment: Five grains hydrochloride four-hourly on first day; subsequently thrice daily.
Remarks: Condition of tongue not noted.

(ii) *Epidemiological Characters:—*

This case occurred on the s.s. 'Mayumba.' The vessel had reached Forcados on the 24th December, 1912, with a cargo of coal from South Wales. She had called at Sierra Leone to embark a native crew. No deck passengers (natives) were carried. She left Forcados for Warri on 6th January, returning to Forcados on the same day and subsequently she proceeded to Lagos, where, in February, the patient was admitted to hospital.

No other cases occurred on this vessel.

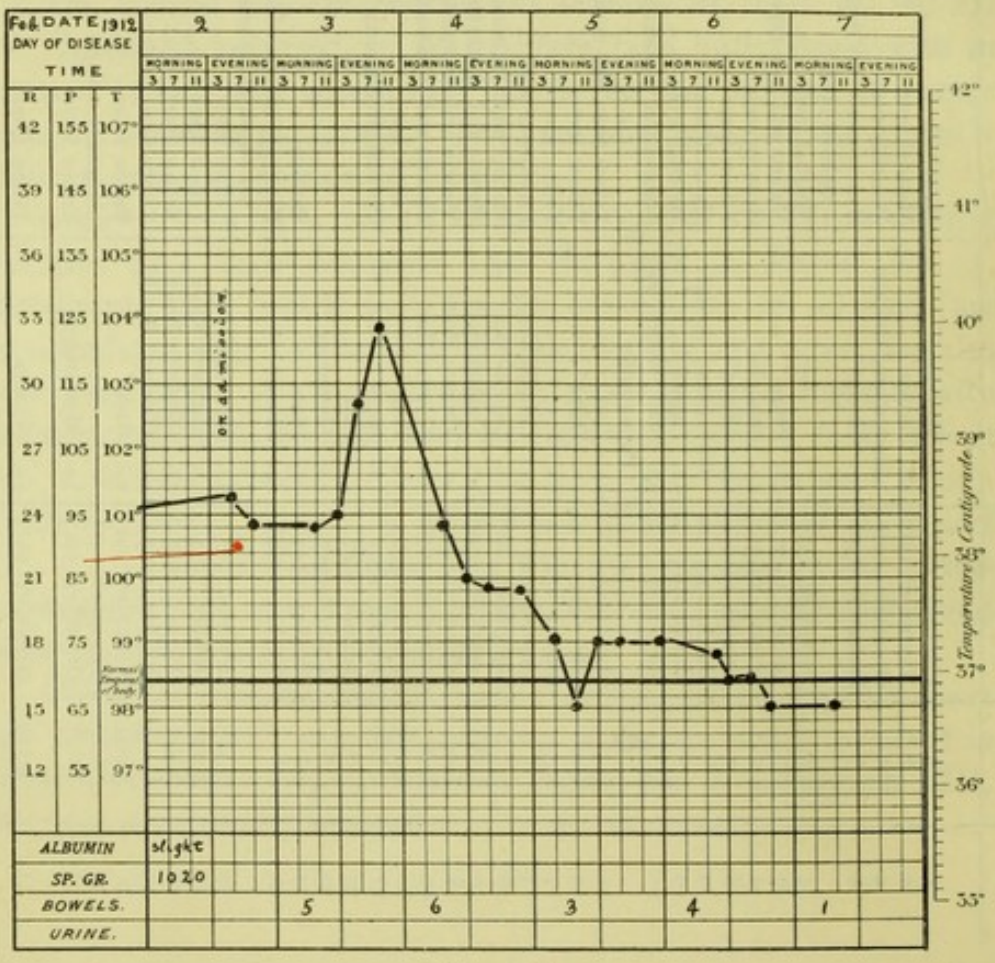


Chart 66

CASE 2

(i) *Summary of Clinical Features:—*

Age: 40.
Sex: Male.
Race: European.
Occupation: Seaman.
Date of admission to Lagos Hospital: November, 1912.
Number of days in hospital: Five.
Diagnosis: Malarial fever.
Result: Recovery.
Urine: S.G. 1025. Albumen present.
Blood: No record.
Quinine treatment: Five grains hydrochloride thrice daily throughout illness.
Remarks: Condition of tongue not noted.

(ii) *Epidemiological Characters:—*

This case occurred on the s.s. 'Lokoja,' a 'branch-boat' plying between Lagos and Forcados (24 hours' journey), and ships lying in Lagos Roads (communication in the Roads is carried on by open boats). The vessel was at Forcados from 26th September to 16th October, 1912, when she left for Lagos. She was again at Forcados from 8th to 9th November. Subsequently she left for Lagos.

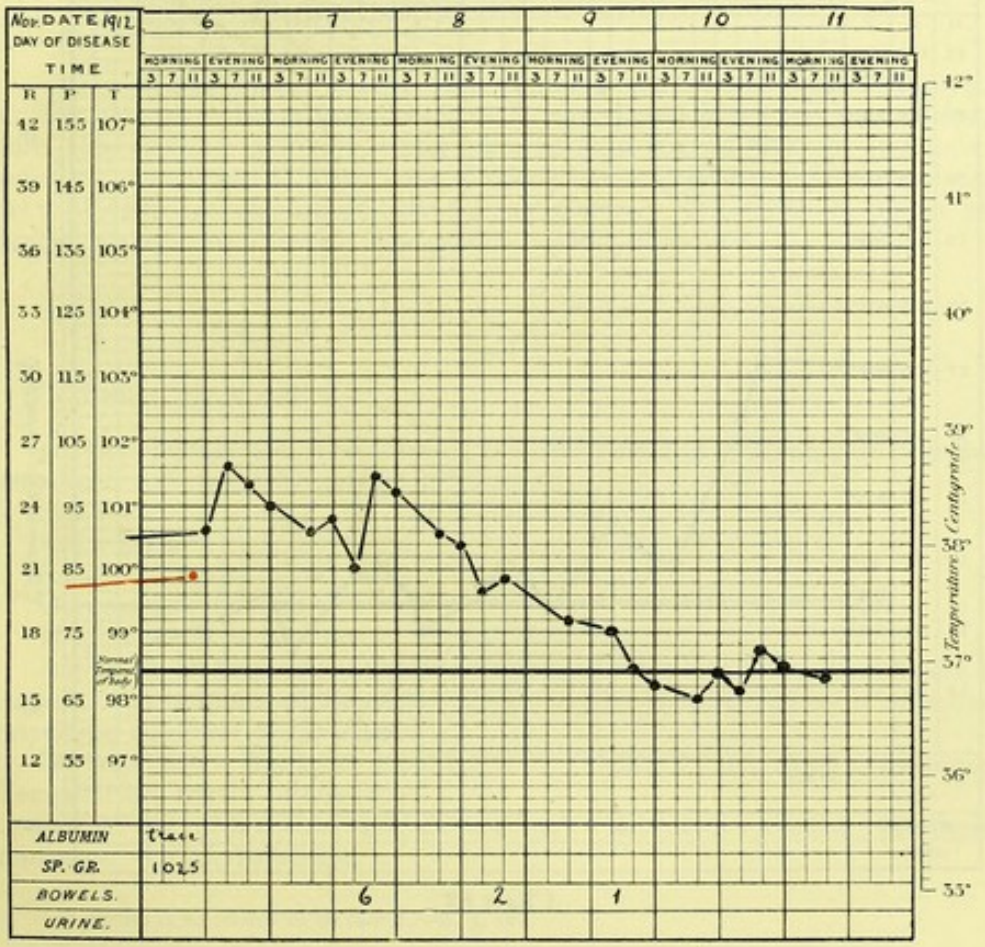


Chart 67

CASE 3

(i) *Summary of Clinical Features :—*

Age : 34.
Sex : Male.
Race : European.
Occupation : Seaman.
Diagnosis : Malarial fever.
Date of admission to hospital : December, 1912.
Number of days in hospital : Five.
Result : Recovery.
Urine : S.G. not recorded. Albumen present.
Blood : No record.
Quinine treatment : Five grains hydrochloride thrice daily throughout illness.
Remarks : Condition of tongue not noted.

(ii) *Epidemiological Characters :—*

This case occurred on the dredger 'Sandgrouse,' engaged on the harbour works at Lagos. The vessel had not been out of Lagos Harbour for six months.

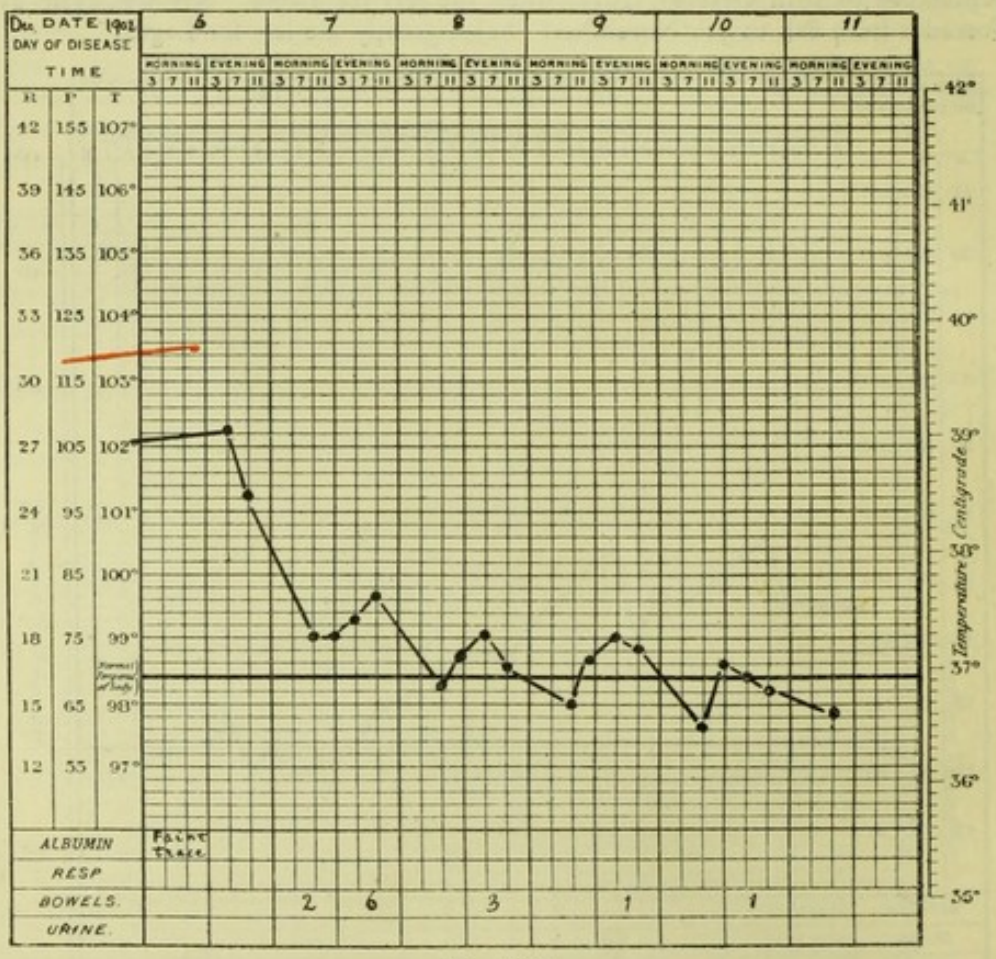


Chart 68

CASE 4

(i) This patient died on board the s.s. ' Shonga,' in Lagos Roads, on 2nd December, 1912.

The following is a copy of the notes of the post-mortem examination, which was performed by the Resident Medical Officer, Lagos Hospital :—

Age : 34.

Death occurred at 5 p.m. on board s.s. ' Shonga,' in Lagos Roads—December 2nd, 1912.

Post-mortem examination held at 1 p.m., December 3rd, 1912, in hospital mortuary, 20 hours after death.

External appearances : Body well nourished. Rigor mortis passing off. Putrefaction had commenced. Bullae on skin. Post-mortem lividity in dependent parts.

Abdomen : Liver, somewhat enlarged, soft, and congested. Stomach, thinning of walls at greater curvature. Mucosa congested. Stomach contents, dark coloured fluid. Spleen, enlarged and soft, almost diffluent.

Temperature of body at time of death was 110° Fahr.

Sections of spleen and liver taken and sent to Medical Research Institute for examination.*

Death certified as due to hyperpyrexia, ' No doubt due to malarial fever.'

The ' Shonga ' did not carry a doctor.

(ii) *Epidemiological Features :—*

The vessel had been in Southern Nigeria waters for one month, and had, while at Forcados, given her cargo to the branch-boat ' Baro,' which was moored alongside. She had also called at several other ports in Nigeria (but not at Sapele—reference cases 6 and 8), from none of which had suspicious cases been reported. At a Liberian port she had embarked a native crew. No cases of the disease had been reported from Liberia. She carried no deck passengers.

CASE 5

(i) *Clinical Features :—*

(As in paragraph viii, Report No. 1, this case is cited in detail because it appears to present some specially significant features.)

Age : ?

Sex : Male.

Race : European.

Occupation : Seaman.

Diagnosis : Malarial fever.

Admitted to hospital : December, 1912. First trip to the West Coast of Africa. Has been out one month. Does not take quinine. There is no record respecting the onset of the illness.

On admission : Headache complained of. Urine, a thick cloud of albumen. Temperature, 103·6°. Pulse, 104.

Second day : Maximum temperature, 104°. Pulse, not recorded. Headache continues. Urine, 19 ounces.

* There is no record to be found.—E. J. W.

Third day: Maximum temperature, 102·9°. Pulse, 88. Urine, 17 ounces, albumen in large amount. Face flushed. Eyes red. Conjunctivae yellowish. Vomited once after quinine; no blood in the vomit. Patient says he feels worse, but is, apparently, better.

Fourth day: Maximum temperature, 101·6°. Pulse, 72.

Fifth day: Maximum temperature, 100·4°. Pulse not recorded. Albumen gone. No jaundice.

Sixth, seventh, eighth, ninth day: Uneventful recovery.

Blood: No parasites found.

Quinine treatment: Five grains* three times a day throughout the illness.

There are no notes respecting the state of the tongue.

(ii) *Epidemiological Characters:—*

Unfortunately the name of the vessel upon which this case occurred is unknown.

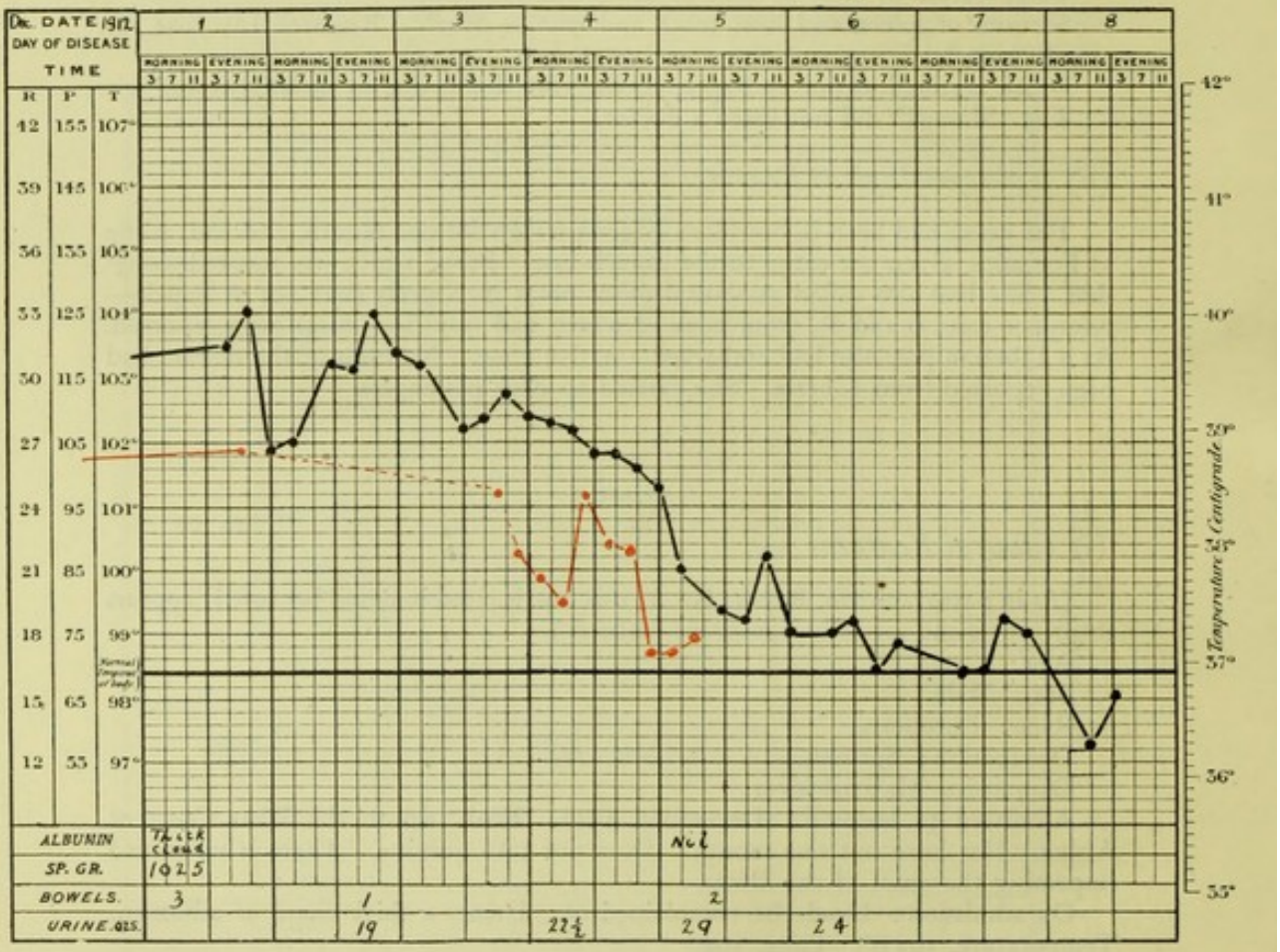


Chart 69

* Probably hydrochloride.—E. J. W.

Case 9

(i) *Summary of Clinical Features:—*

Age: 33.
Sex: Male.
Race: European.
Occupation: Seaman.
Diagnosis: Malarial fever.
Date of admission to Lagos Hospital: March, 1913.
Number of days in hospital: Six.
Urine: Albumen present. S.G. 1025.
Blood: No record.
Quinine treatment.—Five grains hydrochloride morning and night throughout illness.
Result.—Recovery.
Remarks.—Tongue coated on admission.

(ii) *Epidemiological Characters:—*

This case occurred on the dredger 'Sandgrouse,' engaged on the harbour works at Lagos. The 'Sandgrouse' had not been out of Lagos Harbour for six months.

It will be remembered that Case 3 occurred on this vessel—but in December, 1912.

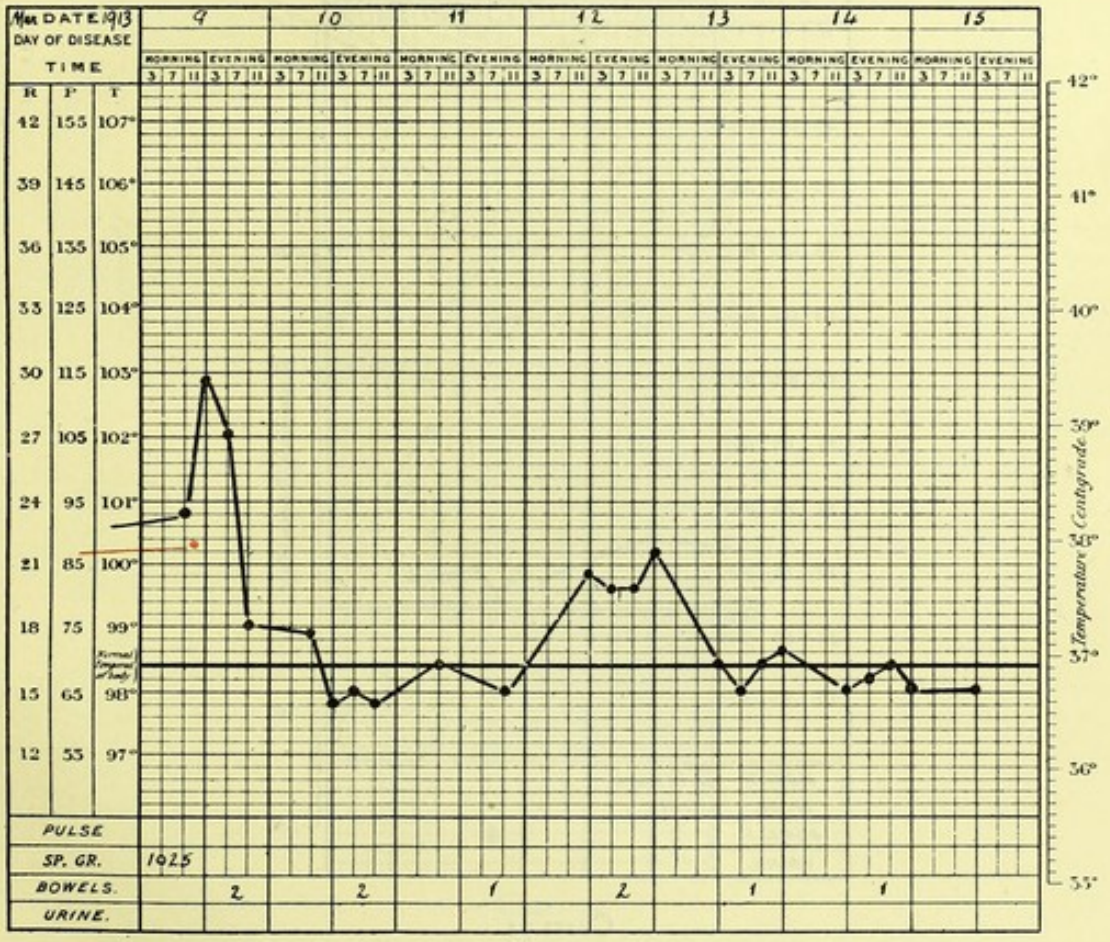


Chart 70

CASE 10

(i) *Summary of Clinical Features:—*

Age: 41.
Sex: Male.
Race: European.
Occupation: Seaman.
Diagnosis: Malarial fever.
Date of admission to Lagos Hospital: March, 1913.
Number of days in hospital: Two.
Urine: Albumen present. S.G. 1019.
Blood: No record.
Quinine treatment.—Five grains hydrochloride morning and night throughout illness.
Result.—Recovery.
Remarks.—Tongue coated on admission.

(ii) *Epidemiological Characters:—*

This case occurred on the s.s. 'Lagoon,' a branch-boat plying between Lagos and Forcados and ships lying in Lagos Roads. She had been at Forcados from 20th February to 7th March, when she left for Lagos.

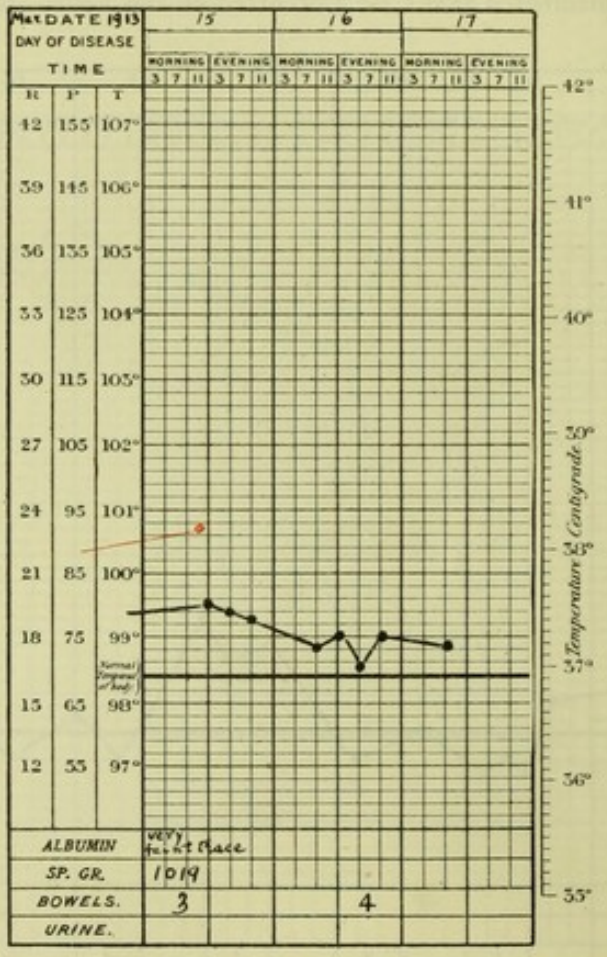


Chart 71

CASE 11. L. 22†

(i) *Clinical Features:—*

This case, as in paragraph VIII, Report No. 1, is cited in detail because it presents many points of interest. It was decided not to be a case of yellow fever, after very careful deliberation.

Age: 28.
Sex: Male.
Race: European.
Occupation: Engineer on s.s. 'Gouverneur von Puttkammer.'
Nationality: German.
Date of admission to hospital: 8th May, 1913.
Date of death: 9th May, 1913.
Diagnosis: Uraemia and malaria.

History.—Patient had been ill three days with fever. Vomited after taking any drink. Bowels had been confined, but were opened by an aperient. No headache.

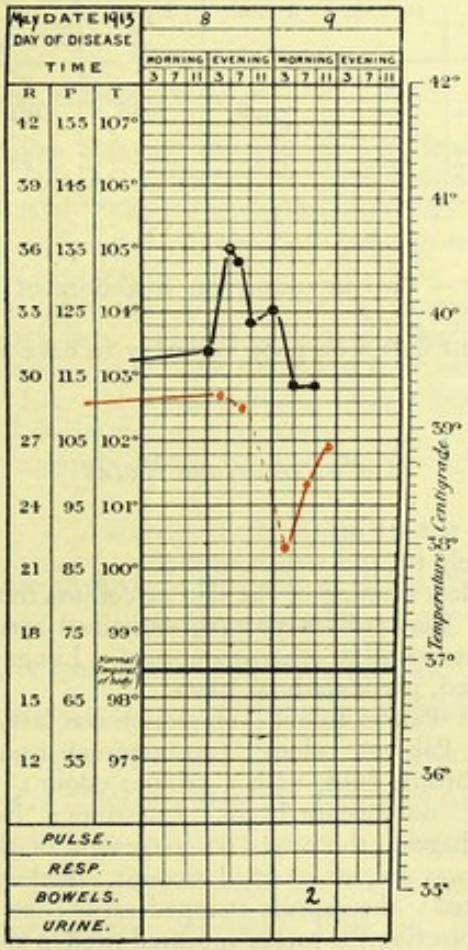


Chart 72

On admission.—Tongue coated. Bowels opened. Liver and spleen normal. No tenderness in epigastrium. Pulse, 112. Heart sounds normal. Respirations, 24. Temperature, 103·4° Fahr. Severe headache. Pupils widely dilated. Face puffy. Slight oedema over both legs. Urine, acid, S.G. 1030, albumen large quantity. Blood, young ring parasites, aestivo-autumnal. Mononuclear leucocytosis.

Course.—12 p.m. on day of admission: Temperature, 104°; vomited once; urine contains albumen, amount passed at 8.45 p.m., four ounces. 9th May, 1913: Patient very restless and delirious; no sleep; no urine passed; bowels opened, watery motions; vomiting very frequent, dark, acid-smelling liquid; saline given intracellularly—250 c.c. 1.30 p.m.: Pilocarpine, grains ¼, given; pupils widely dilated; delirium present. 2 p.m.: Uraemic convulsions began; vomiting very troublesome, dark, acid-smelling liquid. 3.20 p.m.: Died.

Pulse and temperature were as follows:—

	8th May				9th May	
	12 noon	4 p.m.	8 p.m.	12 midnight	4 a.m.	8 a.m.
Temperature	104	104·8	103·8	104	102·8	102·8
Pulse	112	100	—	88	98	104

Quinine treatment.—Two intramuscular injections of quinine on the day of admission (0·4 grams).

Note.—The patient is said on good authority to have been a chronic alcoholic subject.

Post-mortem Notes

Rigor mortis had not set in.

Body was extremely fat and well-nourished.

There was no yellow staining of the skin or conjunctivae.

Thorax.—Heart: Pericardium normal, contained some fluid; heart flabby and large deposit of fat around it, otherwise normal. Lungs: No pleural adhesions; no effusion; congested, particularly at bases.

Abdomen.—Liver: Pale in colour; on section was fatty, the cut surface being greasy. Stomach: Pale in colour; no external haemorrhages; contained a small quantity of brown fluid, with a urinous odour; the mucous membrane was not congested; no haemorrhages. Intestines: Normal in appearance; no external haemorrhages; there was no congestion of the mucous membrane; a brown faecal fluid was present in small amount. Kidneys: Both kidneys were enlarged and congested; the capsule stripped easily; no external haemorrhages were to be seen. On section the cortex appeared swollen and pale. The omentum was extremely fatty and there was a large deposit of fat about the abdomen.

Extract of Report upon Pathological Specimens sent to Research Institute, Yaba

The organs were unfortunately somewhat damaged by being forced into a jar with insufficient preserving fluid; in consequence it is difficult to determine to what extent the appearance of sections is due to this cause, and to what extent to pathological changes. . . .

The kidney was enlarged, its capsule adherent and its surface injected with stellate veins. The cortex was swollen and yellowish, the pyramids not markedly congested. The tubules distended, the epithelium granular. The tubules contained casts. Glomeruli large, capsule thickened. Interstitial tissue somewhat increased.

The liver (small piece) was yellow in section, surface smooth. Extensive and intense fatty degeneration.

The spleen was large and pulpy. The capsule thickened, congested, and dotted with masses of yellowish pigment. (The spleen, however, was certainly insufficiently preserved, as it had putrefied.)

The stomach.—Several minute haemorrhages. Mucosa, catarrhal.

The appearances were hardly those one would expect to meet in a case of acute nephritis, and, on the whole, were more suggestive of an acute fever.

I suppose there was no suspicion of yellow fever?

J. W. Scott Macfie.

(ii) *Epidemiological Characters:—*

The vessel from which this case was admitted while she was lying alongside the wharf at Lagos—the 'Gouverneur von Puttkammer'—had sailed from Hamburg on 19th January. The patient sailed with her.

The only intermediate port of call was in Liberia, to embark a native crew.

She carried no deck passengers.

After her arrival in Lagos, the vessel plied solely between Lagos and Forcados and ships lying in Lagos Roads. There had been no sickness on board prior to the patient's illness, and subsequently, also, there was none except the case of a man who was admitted to Lagos Hospital suffering from a typical attack of malarial fever on 21st May and discharged on 2nd June.

The patient was frequently ashore, both at Lagos and Forcados.

General Remarks

It is not possible in any of the above cases (Group A) definitely to trace the source of infection. As far as I have been able to ascertain no other cases presenting anomalous characters occurred on any of the vessels from which they were taken. Messrs. Elder Dempster & Company's Medical Officer, at Forcados, who kindly gave me access to his records, attends all cases of sickness occurring on his Company's ships at that port, unless a ship's medical officer is carried. Elsewhere—with the same exception—cases are attended by Government Medical Officers and are carefully recorded.

None of the ships on which cases in Group A occurred carried a doctor.

Cases 1, 2, 3, 4, and 5 occurred at a time (1912) when no suspicious cases had been reported. At the time when Case 9 occurred no suspicious cases had been reported from Lagos, where the vessel was engaged in dredging, though cases in natives were then occurring at Burutu.

In Cases 10 and 11 the patients may have become infected at Forcados—Burutu being the actual source of infection. As has been mentioned elsewhere, the traffic between Burutu and Forcados is considerable.

It has, however, to be remembered that the 'Mayumba,' the 'Shonga,' and the 'Gouverneur von Puttkammer' (Nos. 1, 4, and 11 respectively) had embarked a native crew on reaching the West Coast of Africa, and may in this way have become infected, though none of these vessels had called at Dakar, the only port on the West Coast which was declared to be infected with yellow fever in the last six months of 1912. It should here be remarked that the case on the 'Gouverneur von Puttkammer' occurred several days *before* the first case of the disease was reported at Lagos, which had come from Abeokuta, and was almost certainly infected there (Report No. 1).

If these cases in Group A were actually yellow fever it is necessary (excluding a possible animal source) to invoke the endemicity of the disease among the natives in order to explain the infection. For it is not to be supposed that these various branch-boats, dredgers, etc., could have been themselves infected and conveyed the disease to one another and yet that only sporadic cases should have occurred. On none of the vessels mentioned were there less than three or four Europeans whose quarters would be closely associated. I conclude that the patients must almost certainly have become infected ashore.

Moreover, the vessels on which Cases 2, 3, 9, and 10 occurred had not been out of Southern Nigeria waters for many months before the patients were taken ill, and the vessels on which Cases 1, 4, and 11 occurred had been in Southern Nigeria waters for at least one month before the patients were taken ill, and, previously, had come direct from Europe, only stopping on first reaching the West

Coast of Africa to embark a native crew. The possibilities of infection from this source have already been discussed (see Cases 3, 4, 5, Section I, paragraph vii).

Group B

Case 6

This patient died at Sapele (Niger Delta), on board the s.s. 'Patani,' a cargo-boat, plying between Liverpool and the West Coast of Africa, on the 10th January, 1913. No post-mortem examination was performed.

The following is a copy of the notes of the case by the then Medical Officer, Sapele :—

> 'I was called to see the patient on the s.s. 'Patani,' on January 10th, 1913. Arrived there about noon. Found him unconscious. Temperature 108·4°. Pulse running. He died at 4.40 p.m. There were no signs of yellow fever. No urine was passed during the time I attended him. Death, in my opinion, was due to a hyperpyrexial attack of malaria, in a non-quinine taker and debilitated subject.
>
> 'Previous habits.—This was his first voyage to West Africa, but he had made one to East Africa. From what I could gather, he was addicted to the drug habit. The night before he died, he was seen to take a sixty minim measure full of chlorodyne. Five minutes afterwards he fell down as if in a fit, frothing at the mouth. He was put to bed, and appeared at breakfast next morning, to all appearances quite normal, and ate a good breakfast—the first for many days (this is the statement made by a steward).
>
> 'About 10 a.m. he appeared to be raving, so they sent ashore for the Medical Officer. I was away in the town and did not see him until noon.
>
> 'I attended one other case on board the 'Patani' : a deck hand suffering from a slight attack of malaria. During the time the s.s. 'Adansi' was here (three days) no illness was reported to me.'

It is not known whether the patient was a quinine taker or used a mosquito net.

The Medical Officer, who attended the case, and whom I met later in the course of my inquiry, further informed me that :—

> The patient was an alcoholic subject, and was also addicted to the use of morphia.
>
> When first seen, at noon on the day of his death, the temperature was 108·4°.
>
> At one o'clock he was given an intramuscular injection of bihydrochloride of quinine—10 grains—and was placed in an ice bath. The temperature dropped to 104·5°. There was then commencing cardiac failure. A second ice bath was given one hour later, when the temperature had risen again to 106°. After one hour's immersion this was reduced to 104°.
>
> Except when first seen, the patient was unconscious. There was no jaundice, rash, or discolouration evident after death.
>
> According to the captain of the vessel there had been no sickness on board previously.

The ship had been in Southern Nigeria waters from January 3rd (seven days). The following had been her itinerary : Liverpool, Madeira, Teneriffe, Grand Canary, Conakry, Sierra Leone, Cape Palmas, Lahou, Half Jack, Grand Bassam, Assinee, Axim, Sekondi, Cape Coast, Saltpond, Accra, Kotonou, Brass, Akassa, Forcados.

On arrival off the West Coast of Africa she, as usual, embarked a native crew. She carried no deck passengers.

She arrived at Forcados on 3rd January and her course was then as follows :—

Arrived Forcados	3rd January.
Left Forcados	4th January.
Arrived Warri	4th January.
Left Warri	6th January.
Arrived Koko	7th January.
Left Koko	8th January.
Arrived Sapele	8th January.
Left Sapele	11th January.
Arrived Koko	11th January.
Left Koko	15th January.
Arrived Forcados	15th January.
Cleared for home	17th January.

Whilst at Forcados, on 3rd January, the branch-boat 'Bassa' was moored alongside and took her cargo.

It should be remarked : (*i*) That Messrs. Elder Dempster & Company's Medical Officer at Forcados was called to see an Engineer on the 'Patani' upon her return to Forcados from Sapele. He had suffered from (?) 'bad fever' at Sapele, but was convalescent when seen at Forcados. (*ii*) That the 'Patani' was at Koko and Sapele, on the 7th and 8th of January, simultaneously with the s.s. 'Adansi,' on which ship a death from yellow fever subsequently occurred at Saltpond (Gold Coast), on the 18th January. It is very probable that interchange of visits between members of the ships' crews took place on these occasions, and that such visits would most probably have been paid after sunset. Also the respective anchorages of the ships would be in a moderately close proximity. Thus infection may readily have been conveyed from one vessel to the other, and it will be noted that the death on the 'Adansi' took place at Saltpond ten days after they had been together. It is, however, improbable that—assuming the 'Patani' case to have been yellow fever—the infection was obtained from the 'Adansi,' for the two ships were first together on the 7th January and the patient died on the 10th. It would on the contrary, be more probable that the 'Adansi' patient was infected from the 'Patani,' the patient on the 'Adansi' having died on the 18th January—ten days after the ships were together (see Case 8).

On the assumption of the endemicity of the disease in the Colony, the patient (Case 6) on the 'Patani' was probably infected from a native source at, *e.g.*, Forcados, where the ship stayed from 3rd to 4th January, *i.e.*, six days before his decease. He may have become infected ashore, or infected mosquitoes may have gained access to the ship from the branch-boat 'Bassa' (no cases of sickness had, however, occurred on the 'Bassa').

That there were infected mosquitoes on board the 'Patani' seems improbable, since, with the one exception, no cases of illness occurred on board, and one is, therefore, led to the conclusion that the patient was infected from the native source.

Case 7

This occurred on the s.s. 'Oshogbo,' a branch-boat plying between Lagos and Forcados.

The patient died on the vessel at Forcados, on 12th January. He was attended by Messrs. Elder Dempster & Company's Medical Officer at that port.

His notes of the case are as follows :—

'On the evening of the 11th inst. the deceased had a temperature of 103° Fahr.; much vomiting. Ten grains of quinine were administered with some juice afterwards. On the following morning he was worse, temperature 111° Fahr. He died in my presence. There was nothing special in the case except the high temperature.'

Quinine prophylaxis and use of mosquito net—unknown.

No autopsy was made.

The itinerary of this vessel had been as follows :—

Arrived Forcados from Lagos, 11th December.
Left Forcados for Lagos, 21st December.
At Lagos from 22nd December to 7th January.
Arrived Forcados from Lagos, 8th January.
Left Forcados for Lagos, 17th January.
At Lagos from 18th January to 31st January.

No other cases occurred on this vessel, which did not carry a doctor.

She had been in Southern Nigeria waters for many months. She had not been at Sapele (ref. Cases 6 and 8).

The patient may have become infected at Forcados—Burutu being the actual source of infection (see Section II). As already stated, the traffic between Burutu and Forcados is considerable.

Case 8

This occurred on the s.s. 'Adansi,' a cargo-boat plying between Hamburg and the West Coast of Africa. A European seaman died on board of yellow fever at Saltpond (Gold Coast) on 18th January, 1913. The ship did not carry a Medical Officer and there are thus no notes of the patient's illness. He was found wandering about the deck (which was contrary to orders) at 3 a.m. on the 16th January, and died on the morning of the 18th at 1 a.m. The captain had treated him with phenacetin and quinine, milk diet and Benger's food.

Quinine prophylaxis and use of mosquito net—unknown.

The following is a copy of the notes of the autopsy made by the Government Medical Officer at Saltpond :—

Notes on Post-mortem made at 8.45 *a.m. on board the s.s.* '*Adansi*.'

External.—The body of a well-nourished adult male, aged about 35 years. No marks of violence.

1. Rigor mortis well marked.
2. The whole surface of the body presented an intensely jaundiced appearance.
3. Petechiae over the side of the neck and chest, and extravasations of blood all over the back.
4. Hands, feet, and genitals cyanosed.
5. Rectal temperature 104° Fahr.
6. Liver normal in size and of an intense yellow colour.
7. A brownish grumous looking fluid was welling out of the mouth.
8. Stomach—intensely hyperaemic, especially towards the cardiac end.
9. Stomach contained about half-a-pint of black tarry fluid.
10. Heart, normal in size, somewhat flabby.

N.B.—The body was sewn up in canvas, weighted with iron, and taken two miles out to sea and buried.

The itinerary of the vessel had been as follows:—Hamburg, Rotterdam, Teneriffe, Las Palmas, Sierra Leone, Axim, Sekondi, Cape Coast, Saltpond, Appam, Winneba, Accra, Addah, Burutu, Warri, Koko, Sapele, Forcados, Addah, Accra, Winneba, Appam, Saltpond.

The vessel had been in Southern Nigeria waters from 21st December to 12th January, when she left Forcados for the Gold Coast. She had been at Koko and Sapele on the 7th and 8th January simultaneously with the s.s. 'Patani,' on which a death of a doubtful nature occurred on 10th January. (See Case 6.)

On the 12th January—the day before clearing for the Gold Coast—the vessel was visited at Forcados by Messrs. Elder Dempster & Company's Medical Officer. There was then, as he informed me, no sickness on board.

Therefore, allowing a maximum incubation period of six days, the patient must have become infected on or after the 7th January. Hence the locality of his infection must have been either:—

1. The Gold Coast, or
2. Southern Nigeria, either:—
   - (i) On board the 'Patani' at Koko or Sapele,
   - (ii) on board the 'Adansi,' or
   - (iii) ashore at Koko, Sapele or Forcados.

1. Possibility of patient's infection on the Gold Coast.

Between Forcados and Saltpond the vessel called at Addah on 13th January, at Accra on 15th January, at Winneba on 16th January, and at Appam on 17th January.

If the patient became infected *on the ship* while she was at any of these ports between Forcados and Saltpond, he must have become so by a mosquito which had received its infection at least twelve days previously; *i.e.*, the insect must have been brought aboard at these ports in an infective condition. This is unlikely, as ships lie in the Roads, a considerable distance (1-2 miles) from the shore and traffic is carried on by open surf boats. Again, the patient may have gone ashore at these ports at night—an improbable contingency, I am informed—and there become infected. In either case, the number of days between the dates of call and his death: five, three, two, and one, respectively, in the case of Addah, Accra, Winneba and Appam would, with the exception perhaps of Addah, connote a remarkably short incubation period and course. I do not emphasize the fact that no cases of yellow fever had been reported from these ports, since, assuming the endemicity of the disease, this ceases to be an important consideration.

From the above facts it is therefore to be inferred that he did not become infected on the Gold Coast.

2. Possibility of patient's infection in Southern Nigeria.

(i) On board the 'Patani' at Koko or Sapele.

This is rendered improbable by the fact that no suspicious cases other than Case 6 occurred on this vessel.

(ii) On board the 'Adansi.'

This is also rendered improbable for the same reason—that no other cases of the disease occurred on the ship either while she was in Southern Nigeria waters or subsequently as far as can be ascertained.

(iii) Ashore at Koko, Sapele, or Forcados.

It having been conceded that infection as described in the above paragraphs is improbable, the patient must almost certainly have contracted the disease ashore at Koko, Sapele, or Forcados, the only places at which he would have

been able to leave the ship. As no suspicious European cases had been reported from any of these places, he must have acquired the illness from a native source.

It follows from this conclusion that the simultaneous presence of the 'Adansi' and 'Patani' at Koko and Sapele on the 7th and 8th January was a coincidence, and that there was no causal connection between this and the 'Patani' case. In order to elucidate the matter as much as possible, and with a view to ascertaining whether any cases had occurred at Sapele or Koko which could be regarded as suspicious, I visited Sapele, the Medical Officer of which district also has Koko under his care, Europeans at the latter place when sick being brought to Sapele Hospital.

I examined all the records of both European and native cases and autopsies from January, 1911, onwards, but found no suspicious cases among them.

Two cases of blackwater fever occurred in 1911, one in 1912, and none in 1913 up to the time of my inquiry (October). I carefully examined the notes of these cases, and found that, as in instances of this disease occurring elsewhere, which I have recorded, there is no reason whatever to suppose that any confusion has occurred between it and yellow fever.

(I found that two cases diagnosed as typhoid fever have occurred at Sapele—one in 1906 and the other in 1913. As this disease forms one of the subjects of inquiry of the Yellow Fever Commission, I have included an account of these with charts in the present Report (Appendix II).) It having been reported that the 'Adansi' patient (Case 8) had been treated for malaria eight days before his death at Benin City, 30 miles from Sapele, whither he would have proceeded overland (probably as an excursion), I proceeded to that town, but was unable to discover any record of the case. I took the opportunity of examining all records from 1911 onwards, but found no cases which could be regarded as suspicious. There was a a case of blackwater fever in 1911 (notes not available) and one in 1912, regarding the accuracy of diagnosis of which there can be no doubt.

Stegomyia fasciata is present at Benin City and at Sapele.

While at Sapele I was informed that a European trader had died in March, 1912, at Silooko, which is situated in the Benin District on one of the creeks of the Niger Delta, and is on the Sapele-Lagos mail-launch route. The Medical Officer at Benin had been unable to reach Silooko until four days after the patient's death.

The agent of one of the trading firms at Sapele saw the patient throughout his illness, and gave me the information which I append:—

> Patient was aged about 30. A strong, athletic man; a trader. Had been in West Africa about 18 months; first tour. Had never been in West Indies or America. 'Felt out of sorts' one afternoon. In the evening his temperature was 101°. Next day it fluctuated between 101° and 102°. On the following day (the third of the illness) he died at 4 p.m., his temperature then being 108·5° Fahr. Blood exuded from the mouth at the time of his death. The patient did not 'have a convulsion.' There was no vomiting throughout the illness and the patient had not complained of headache or pain of any kind. On each of the three days of the illness he took 15 or 20 grains of quinine.
>
> The agent further informed me that the deceased was a temperate man though not a total abstainer. He had taken quinine regularly every day until within a week of his illness, when he had ceased taking both alcohol and quinine because he was then suffering from 'a bad attack of boils,' and thought such abstinence might be beneficial. This is the only European who

has died at Silooko within recent years (there are approximately ten Europeans resident—all traders). There was no exceptional illness among the Europeans or natives at the time of the patient's illness.

The agent also informed me that *Stegomyia fasciata*, which he recognizes as the 'football-jersey mosquito,' was present 'in small numbers' in Silooko.

It is certainly much to be regretted that no professional notes of this case are available.

Case 12. L. 36†

This case occurred on the s.s. 'Epe,' plying between Lagos and Porto Novo. The patient—one of the engineers—was admitted to Lagos Hospital on the 28th May, 1913.

For clinical notes of this case see Dr. Leonard's Report, Case No. 6, page 229.

The patient had been in West Africa only three months. He had previously made voyages to 'the Coast,' but this was the first time he had remained in the country. He was a non-quinine taker, and it is doubtful whether he used a mosquito net.

The s.s. 'Epe' (plying between Lagos and Porto Novo), from which he was admitted to hospital, had left Porto Novo (Dahomey) for Lagos (duration of voyage about nine hours) on the 23rd May, the day before the illness commenced. She had been at Porto Novo three days and was anchored near the shore. The patient had not left the vessel. She carried about 40 native passengers. Her crew consisted of approximately 20 natives and four Europeans.

In the absence of any other cases of illness on board, it is to be supposed that the patient was not infected on the ship, but that he received his infection in Lagos previous to embarkation. It has, however, to be noted that, Lagos not being at the time in quarantine, the crew and passengers were not kept under observation.

Case 13. L. 46†

This patient, a Krooboy, was a cook on the s.s. 'Delta,' plying between Lagos and Forcados.

For clinical notes of this case see Dr. Leonard's Report, Case No. 16, page 253.

The course of the s.s. 'Delta' previous to the occurrence of this case was as follows:—

Left Forcados	19th June.
Arrived Lagos	20th June.
Left Lagos	15th July.
Arrived Forcados	16th July.
Left Forcados	21st July.
Arrived Lagos	22nd July.

The patient was admitted to Lagos Hospital on the 28th July.

From the 22nd to the 28th July the vessel lay alongside the wharf during the day-time, but at night she was anchored in the Lagoon at a considerable distance from the shore.

Cases of yellow fever were occurring at Lagos at this time.

The patient was a non-quinine taker and did not use a mosquito net.

Case 14. L. 53†

This patient, a 'Krooboy,' was a quartermaster on the s.y. 'Ivy.'

He was almost certainly infected ashore.

The case is, however, included here among 'ship' cases for the sake of completeness.

For clinical notes of this case see Dr. Leonard's Report, Case No. 20, page 259.

The 'Ivy' had arrived at Lagos from Bonny on 1st July. She remained in Lagos Harbour until August 17th, when she proceeded to Forcados, and was there fumigated. The patient, it will be remembered, was admitted to hospital on 16th August.

During the period 1st July to 16th August, the patient had stayed on shore practically every night. No cases had been reported in the vicinity of his place of residence.

An infected area was declared and no further cases occurred. *Stegomyia fasciata* was found within the area.

No cases occurred on the 'Ivy,' the crew of which numbered six Europeans and forty-seven natives.

Cases 15, 16, 17, 18, 19

For the account of these cases see Section I, paragraph VII.

Cases 16, 17, 18, 19 correspond respectively to Cases 6, 3, 4, 5 in that section. Case 15 is described with Case 6 in that section.

Case 20. L. 113

This patient, an officer of the s.s. 'Zaria,' sailing between Liverpool and the West Coast of Africa, died on board at Forcados, on the 18th October.

Unfortunately, the details of the illness, which the ship's surgeon was able to supply to the Medical Officer, Forcados, are meagre.

For notes of this case see Dr. Leonard's Report, Case No. 36, page 286.

Prophylactic use of quinine and mosquito net—unknown.

Others sick on board—one lady and one man down with fever. Urine said to have contained albumen, but ship's doctor himself very 'seedy' and not fit for work at the time. The man had bled from the nose. Both cases sent to Warri Hospital.*

The following were the movements of the 'Zaria' from the time of leaving England :—

Liverpool	16th August.
Teneriffe	22nd August.
Las Palmas	23rd August.
Dakar (harbour)	27th August.
Bathurst (river)	28th August.
Sierra Leone (harbour)	31st August.
Monrovia (Roads 1—2 miles from shore) ...	4th September.
Grand Bassam ,, ,, ...	5th September.
Cape Palmas ,, ,, ...	6th September.
Half Assinee ,, ,, ...	8th September.
Axim ,, ,, ...	9th September.
Sekondi ,, ,, ...	10th September.
Cape Coast ,, ,, ...	13th September.
Winneba ,, ,, ...	13th September.
Adda ,, ,, ...	15th September.
Accra ,, ,, ...	16th September.
Addah ,, ,, ...	18th September

* There was no evidence of yellow fever in either of these cases whilst in Warri Hospital. They were kept under observation for some days, and then discharged.—E.J.W.

Forcados (alongside wharf)	... ...	23rd-26th September.
Bonny (river)	... ...	27th September.
Okrika ,,	... ...	28th September.
Bakana ,,	... ...	29th September.
Buguma ,,	... ...	29th-30th September.
Abonnema ,,	... ...	30th Sept.—2nd Oct.
Bonny ,,	... ...	2nd October.
Opobo ,,	... ...	3rd-10th October.
Bonny ,,	... ...	10th-11th October.
Abonnema ,,	... ...	11th-12th October.
Buguma ,,	... ...	12th October.
Bakana ,,	... ...	12th-13th October.
Bonny ,,	... ...	13th October.
Okrika ,,	... ...	14th-15th October.
Bonny ,,	... ...	15th October.
Forcados (anchored in the river on this occasion)		16th-25th October.

On reaching the African Coast the vessel, as usual, embarked a native crew.

From the time of leaving Opobo (10th October), she carried deck (native) passengers.

The captain informed me (i) that, to his knowledge, the patient did not go ashore within a fortnight of his illness, but that he may have done so: (ii) that he used a mosquito net: (iii) that the ship was infested with mosquitoes, especially at Bakana and Okrika, at which places the inconvenience they cause is so great that the vessel does not remain overnight unless absolutely necessary. On this voyage she remained overnight at both places (*i.e.*, within six days of the patient's death).

With the exception of Forcados, where cases in natives were occurring at this time, no suspicious cases had been reported from any of the places in the above itinerary, and none were reported subsequently to the 'Zaria's' visit. No further cases occurred on the ship. The patient must, therefore, almost certainly have become infected from a native source.

It has, however, to be noted that three cases of yellow fever occurred on the s.s. 'Elizabeth Brock'—Nos. 27, 28, 29, on the 26th October. The 'Zaria' and the 'Elizabeth Brock' were at Opobo together on the 6th October, and, on that date, a European passenger was transferred from the latter to the former.

By the courtesy of Messrs. Woermann's Agent at Lagos, I was able to ascertain that the vessels had been anchored about 700 yards apart, and that the 'Elizabeth Brock' had been anchored about 150 yards from the shore. The passengers were conveyed by an open steam launch (no cabin) from one vessel to the other.

The interval between the date at which the vessels were at Opobo simultaneously and the first development of symptoms of illness was respectively as follows:—

'Zaria'	3-7 days.
'Elizabeth Brock'	17 days.

It appears, therefore, improbable that the 'Zaria' case was infected from the 'Elizabeth Brock.'

Cases 21, 22, 23, 24

These cases (Nos. 21, 22, 23, 24) are described in Section II, in which they are respectively Cases 39, 46, 47, 48.

All were natives and all occurred on vessels from Lagos, which was at the time in quarantine.

It will be seen on reference to Section II that Case 39 was considered to be suffering from cyclical albuminuria.

As Cases 46, 47, and 48 were the only cases of illness on the respective ships, it is probable that they became infected at Lagos previous to embarkation.

Case 25

The patient was an officer on the s.s. 'Elmina,' a passenger steamer, sailing between Liverpool and the West Coast of Africa. He died on 23rd October, between Forcados and Lagos.

For notes of this case see Dr. Leonard's Report, Case No. 37, page 287.

The course of the 'Elmina' had been as follows:—

Left Liverpool	10th September.
Las Palmas	16th September.
Sierra Leone	21st September.
Monrovia	22nd September.
Sekondi	24th September.
Cape Coast Castle	25th September.
Accra	25th September.
Lagos Roads	26th September.
Arrived Forcados	27th September.

The vessel was anchored in the river at Forcados one or two days, not less than 300 yards from the shore. She then proceeded to Burutu for about two days, where she moored alongside the wharf. She then returned to Forcados and remained there about two days.

Left Forcados	4th October.
Bonny	5th October.
Arrived Calabar	6th October.

The vessel was anchored in the river at Bonny not less than 200 yards, and at Calabar not less than 300 yards, from the shore, except for one day at Calabar, when she was moored alongside the wharf.

Left Calabar	12th October.
Bonny	13th October.
Arrived Forcados	14th October.

The vessel was at Forcados and at Burutu on the return for about the same time as on the outward voyage.

Left Forcados	22nd October.
Lagos Roads	23rd October.

At all ports of call in Africa the vessel lay in the Roads about 1—2 miles from the shore, with the exception of Sierra Leone (anchorage in the harbour not less than approximately 200 yards from the shore), Forcados, Burutu, Calabar, and Bonny (as described). I am informed that it is improbable that the patient was ashore at night anywhere, except possibly at Burutu. As is usual, the vessel embarked a native crew on the outward voyage at Sierra Leone. The number of Europeans on board at the time of reaching Lagos on the homeward voyage was approximately eighty. The number of natives was approximately forty.

Special inquiry was kindly made, at my request, by Messrs. Elder Dempster

and Company's Agent at Lagos, upon the return of the 'Elmina' to Nigeria, as to whether any deaths or any suspicious cases of fever had occurred on the vessel subsequent to the present case. He informed me that none had occurred. The inference in this, as in the other instances in this section of isolated cases on ships, is that the patient was infected from a native source ashore.

Prophylactic use of quinine and mosquito net by the patient—unknown.

Case 26. L. 129

This case occurred on the s.s. 'Monrovia,' a cargo boat, at Calabar, on 26th October. He was admitted to hospital on the same day.

For clinical notes of this case see Dr. Leonard's Report, Case No. 38, page 289.

The course of the vessel had been as follows :—

Left Hamburg	6th August.
Port Talbot (S. Wales) ...	10-30th August.
Sierra Leone	13-16th September.
Sekondi	20-21st September.
Accra	21-24th September.
Lagos Roads	25-27th September.
Forcados	28th September to 20th October.
Arrived Calabar	22nd October.

On arrival at the West Coast of Africa, a native crew had been embarked.

The vessel had not been alongside the wharf at Forcados or Burutu. It is probable, however, that lighters or 'branch-boats' were alongside, but I have been unable to ascertain this definitely. She was alongside the wharf at Calabar for four days prior to admission of the patient to hospital. It is not known whether he was ever ashore, or whether he used a mosquito net or took quinine for prophylaxis.

No suspicious cases were reported from Calabar either before or after the 'Monrovia's' visit, and no other cases occurred on board.

Cases 27, 28, 29. L. 102,† 103,† 104†

These cases occurred on the cargo-steamer 'Elizabeth Brock.'

Case 27 died on board the vessel on the 26th October, before being seen by a Medical Officer : the body was brought ashore for post-mortem examination.

Cases 28 and 29 were admitted to Lagos Hospital on the 26th October.

Quinine prophylaxis.—Every European, including the patients, received one gramme of quinine every five days whilst on the Coast.

It is not known whether the patients used mosquito nets.

They were said not to have been ashore since the arrival of the vessel on the Coast.

For clinical notes of these cases see Dr. Leonard's Report, Case No. 29, page 274, Case No. 30, page 276, and Case No. 31, page 278.

The itinerary of the vessel had been the following as nearly as can be ascertained :—

Forcados	23-30th September.
Calabar	2-5th October.
Opobo	6th October.
Bonny	11th October.

She then proceeded to Buguma, Abonnema, Degema, and returned to :—

Bonny	16th October.
Calabar	17th October.
Oron	19th October.
Calabar	21st October.

She left Calabar on the 21st October and arrived at Lagos on the 24th October. Deck (native) passengers had been carried as follows :—

10 from Cape Palmas to Lagos.
5 from Cape Palmas to Bonny.
27 from Cape Palmas to Opobo.
7 from Cape Palmas to Calabar.

No suspicious cases had occurred prior to the ship's arrival either at Calabar, Bonny, Opobo or Degema. There is no Medical Officer stationed at Buguma, Abonnema, or Oron.

It will be seen on reference to Section II of this Report that numerous cases in natives were occurring about this time at Forcados, where the vessel had remained for one week, and where (as also at Calabar) branch-boats had been moored alongside.

The fact that the 'Elizabeth Brock' and the 'Zaria' were together at Opobo on the 6th October and that a passenger was transferred from the former to the latter is interesting. It will be remembered that an officer of the s.s. 'Zaria' died of yellow fever at Forcados on the 18th October (Case 20), and that he first became ill about the 9th to 13th October, *i.e.*, 3-7 days after the ships had been together at Opobo. The 'Elizabeth Brock' patients first became ill 17-18 days after the vessels had been together. Both vessels had called at Forcados, Opobo, Bonny, Buguma and Abonnema, but simultaneously only at Forcados and Opobo.

Case 30. L. 105†

This case occurred on the s.s. 'Bassa,' a branch-boat plying between Lagos and Forcados, and was admitted into Lagos Hospital on the 26th November. The patient first felt ill on the 21st November, while the vessel was at Forcados, and on the instructions of the master, he called upon Messrs. Elder Dempster's Medical Officer at that port.

'On his return to the ship, he informed the master that he had a temperature above normal and he was immediately ordered to his room. His temperature appears to have fluctuated somewhat from that date onwards' (extract from letter from Messrs. Elder Dempster's Agent, Lagos).

When Dr. Gray saw the patient at 8.20 a.m., on 26th November at Lagos, the temperature was 102° Fahr., pulse 92. There was no vomiting. Frontal headache and loin pains were complained of. The patient was sent into hospital.

It is not known whether he was a quinine taker or used a mosquito net.

For clinical notes of this case see Dr. Leonard's Report, Case No. 32, page 279.

The 'Bassa' is a branch-boat plying between Lagos and Forcados. She had arrived from the latter port on the 24th November, having sailed on the preceding day. Her movements for some weeks previously had been as follows :—

Left Lagos	1st October.
Arrived Forcados	2nd October.
Left Forcados	16th October.
Arrived Lagos	17th October.
Left Lagos	7th November.

Arrived Forcados	...	...	...	8th November.
Left Forcados	...	...	...	15th November.
Arrived Burutu	...	...	...	15th November.
Left Burutu ...	...	...	...	16th November.
Arrived Forcados	...	...	...	16th November.
Left Forcados	...	...	...	23rd November.
Arrived Lagos	...	...	...	24th November.

It will have been seen (Section II), that cases in natives occurred at Forcados in October and November, and I understood that the patient was probably ashore on various occasions after sunset during the two periods (each of about two weeks' duration) when the vessel was at that port.

Upon her arrival at Lagos, on the 24th November, she was moored alongside the wharf.

Case 31. *Commission number not obtainable*

This case was diagnosed as malignant malaria.

In view of the cases of yellow fever that had occurred recently in Nigeria, it will be seen that the differential diagnosis will have been a matter of some nicety.

The patient died at Port Harcourt five days after his arrival, and I include the case in this series as it is possible that he may have become infected on shipboard.

The following is a copy of the clinical and post-mortem notes by the Medical Officer at Port Harcourt :—

> The deceased left Accra on 22nd November, and, staying six days at Lagos, arrived at Port Harcourt on the 2nd December. He had been abroad before this tour in the tropics. Little else is known of him here, except that he was very slow in his speech and that a bottle of quinine bisulphate was found in his baggage.
>
> On 6th December, at 6 a.m., I was summoned to him by his cook, who had just found him lying on the ground unconscious, having fallen off his bed through his mosquito net. His tent and the contents thereof were in apparent order. He was vomiting, with incontinence of urine and faeces, Breathing, stertorous. Pupils, equal, active, and normal. Temperature. 103° Fahr. Pulse, 110. Respirations, 36. No sign of jaundice. Urine contained a trace of albumen, which did not increase in amount later. The vomit had no unusual character at first, but later was bilious. Faeces appeared normal. Active measures for malarial coma were taken, but there was no sign of improvement until that night at 11 p.m. From then until his death he remained semi-conscious.
>
> The following notes show the treatment and course of the case :—
>
> *6th December.*—6 a.m.: Quin. bihyd., 15 grains, intramuscularly. 6.30 a.m.: Quin. bihyd., 15 grains, per rectum. 7.30 a.m.: Quin. bihyd., 20 grains, per rectum; hot packs started. 8 a.m.: Quin. bihyd., 10 grains, whisky 2 ounces, per rectum. 9.30 a.m.: Ditto. 11.30 a.m.: Ditto. 1.30 p.m.: Packs stopped. 2.0 p.m.: Quin. bihyd., 5 grains, whisky 2 ounces, per rectum; profuse sweating. 3.0 p.m.: Dried and rubbed down. 3.30 p.m.: Tepid sponging. 5.0 p.m.: Ice pack to head. 6.0 p.m.: Whisky 1 ounce, per rectum; ice-packs. 7 p.m.: Ice packs. 8.0 p.m.: Quin. bihyd., 5 grains, whisky 1 ounce, per rectum; ice packs. 9.0 p.m.: Whisky 1 ounce, per rectum; ice packs. 11.0 p.m.: Whisky 1 ounce, per rectum. Midnight: Semi-conscious.

7th December.—2.30 a.m.: Whisky 1 ounce, per rectum. 5.0 a.m.: Whisky 1 ounce, per rectum. 7.0 a.m.: Whisky 1 ounce, per rectum. 1.0 p.m.: Delirious. 3.30 p.m.: Quin. bihyd., 10 grains, whisky 1 ounce, per rectum; ice packs. 4.0 p.m.: Ice packs. 4.30 p.m.: Ditto. 5.30 p.m.: Ditto. 6 p.m.: Enema saponis; ice packs. 7.0 p.m.: Whisky 1 ounce, per rectum. 8.0 p.m.: Quin. bihyd., 10 grains, whisky 1 ounce, per rectum; ice packs. 9.0 p.m.: Whisky 1 ounce, per rectum; ice packs. 10.0 p.m.: Whisky 1 ounce, per rectum; ice packs.

Death took place at 10.30 p.m. on 7th December.

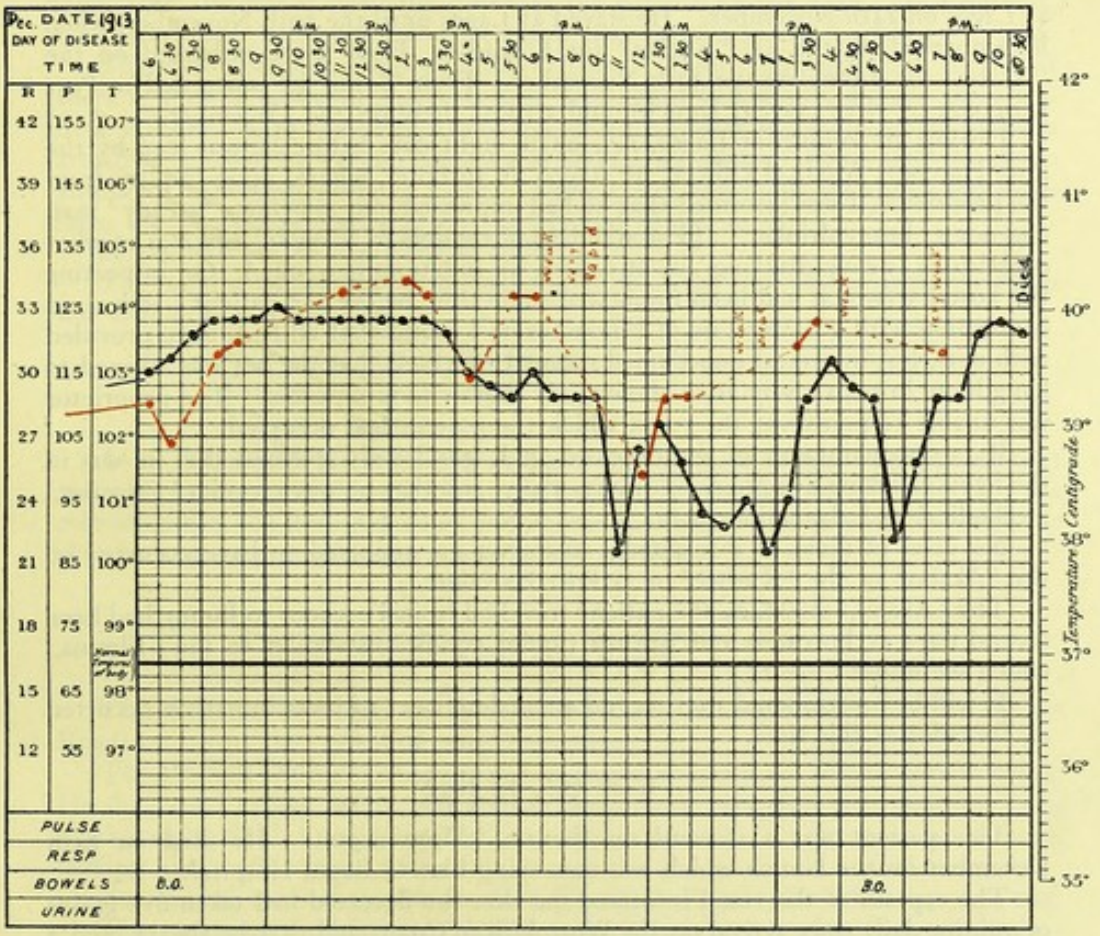


Chart 73

Post-mortem Examination, 10 *a.m.*, 8*th December.*

No trace of jaundice or subcutaneous haemorrhages. Rigor mortis well marked.

Brain.—Vessels markedly congested, substance rather soft.

Heart.—Coronary vessels dilated, with all the chambers distended with blood and ante- and post-mortem clots. Valves competent. Muscle healthy, but pale.

Lungs.—Congested. Otherwise appeared normal.

Liver.—Nearly double normal size, firm, cloudy swelling, no evidence of yellow coloration in the liver substance.

Gall bladder.—Distended with bile.

Spleen.—Slightly enlarged, smooth, dull plum-colour, substance dark and softish.

Kidneys.—Pale. Constituents otherwise seemed normal.

Stomach and bowels.—Did not appear unduly congested. There was no bile-staining nor submucous haemorrhage evident. Contents appeared normal, except for bile-stained mucus in the stomach.

The patient left Accra on the 22nd November by the s.s. 'Akabo,' and arrived at Lagos on 24th November. He stayed at Lagos until the 29th November, when he embarked on the s.s. 'Karina' for Forcados. Here he re-embarked on the 'Akabo' for Bonny on the 30th November. From Bonny he proceeded to Port Harcourt by river craft (? launch), and arrived there on 2nd December.

During his sojourn at Lagos, *i.e.*, up to eight days before he was seen by the Port Harcourt Medical Officer, he stayed at an hotel, where, upon inquiry from the proprietor, I was informed that he had impressed him as being a 'steady' man and not a 'heavy drinker.' (The standard of vendors of alcoholic liquor as to what constitutes 'heavy drinking' is, of course, an indeterminate one.) On inspecting the hostelry (which had been fumigated some time before the patient's arrival, in connection with a native case of yellow fever) I found that all beds were provided with nets, but in several unoccupied rooms I observed that the net was allowed to hang loose in such a way as to allow ready ingress to mosquitoes. The proprietor was unable to point out the room which the patient had occupied.

By an acquaintance of the deceased in Lagos I was informed that he was in the habit of taking five grains of quinine daily, and that he was a 'quiet,' 'regular,' methodical and abstemious man.

No cases of fever of a suspicious character are reported to have occurred on the 'Akabo' or the 'Karina,' or at Port Harcourt.

The 'Akabo,' on which the patient travelled from Forcados to Bonny had been several days at Forcados and Burutu (under conditions similar to the 'Elmina,' which see under Case 25.)

It will be remembered that several anomalous cases of fever in natives occurred at Forcados at this time.

Case 32. L. 107†

This patient was a steward on the s.s. 'Montenegro.' He died on 24th December on the launch which was conveying him to Lagos Hospital.

The captain of the vessel informed me that the deceased had taken five grains of quinine daily since arrival on the West African Coast, and that he always used a mosquito net.

For clinical notes of this case see Dr. Leonard's Report, Case No. 34, page 283.

The course of the s.s. 'Montenegro' had been as follows :—

Left Port Talbot (South Wales) ...	28th October.
Arrived Sierra Leone	12th November.
Left Sierra Leone	12th November.
Arrived Sekondi	17th November.
Left Sekondi	12th December.
Arrived Lagos	14th December.

At Sierra Leone the vessel was anchored half a mile from the shore, in the harbour. She here embarked a native crew (53).

At Sekondi the vessel was anchored in the Roads, 1—2 miles from the shore. She remained there for over three weeks and embarked 61 native passengers.

On arrival in Lagos Harbour the ship anchored, on account of her draught, at Wilmot Point, more than a mile from the wharves and usual anchorages and from the native town. She remained there from the 14th to 19th December and then went alongside the wharf at Iddo. Iddo is the railway terminus and is situated on the opposite side of the Lagoon to Lagos, being joined to the town by a bridge approximately 700 yards in length. Near the Lagos end of the bridge, a case of yellow fever in a native had occurred on 27th August, and *Stegomyia fasciata* had been found in the infected area. The vessel remained alongside the Iddo wharf from 19th December until the death of the patient on the 24th. The patient, I was informed, had been ashore at all ports of call, including Lagos.

There is a sparse native population at Iddo. About 250 yards from the wharf there is a small group of native houses, and about half-a-mile distant there is a little village. With these exceptions the native population consists of the servants attached to some half-dozen houses and several watchmen, who guard the stores and sheds near the railway at night. These stores and sheds are about 100 yards from the wharf, the houses approximately 200 to 500 yards.

Stegomyia fasciata is present at Iddo.

The number of persons on the vessel at Iddo at the time of the patient's illness was as follows :—

Europeans (not including the patient)	24
Creole	1
Natives	64

As no other cases of the disease occurred on the vessel it is to be supposed that the patient became infected ashore at Lagos. It was not possible to trace the movements of the deceased when away from the ship. The captain informed me that he may very possibly have been ashore at night.

Case 33. L. 119

This patient, an officer of the s.s. 'Nyanga,' a cargo-boat, died in Lagos Roads on board that vessel on 28th December.

The Medical Officer, Lagos, arrived on board at 4.30 p.m., shortly before death. He diagnosed yellow fever. He found the patient, who had just vomited some black-looking fluid, unconscious and cyanosed, and on his singlet was a black stain, looking like 'coffee-ground vomit.'

For clinical notes of this case see Dr. Leonard's Report, Case No. 35, page 284.

The course of the 'Nyanga' had been as follows :—

Left Hamburg	21st October.
(There were on board 18 Europeans and 10 native firemen.)	
Rotterdam	23rd-26th October.
Monrovia (sea anchorage)	11th-12th November.
(62 Kroomen and 5 small boys were embarked here.)	
Lagos (alongside wharf)	15th-20th November.
Manoka (German West Africa) ...	22nd November.
Calabar	24th-27th November.
(Anchored in river about 300 yards from shore.)	
Oron	27th-28th November.
(Anchored in river about 200 yards from shore.)	

Opobo ... ... 29th Nov.—5th Dec.
(Anchored in river about 300 yards from shore.)
Brass ... ... 6th-8th December.
(Anchored in river about 300 yards from shore.)
Bonny ... ... 8th-9th December.
(Anchored in river about 300 yards from shore.)
Okrika ... ... 9th-11th December.
(Anchored in river about 100 yards from shore.)
Bakana ... ... 11th-12th December.
(Anchored in river about 200 yards from shore.)
Degema ... ... 12th-14th December.
(Anchored in river about 300 yards from shore.)
Abonnema ... ... 14th-16th December.
(Anchored in river about 300 yards from shore.)
Buguma ... ... 16th-17th December.
(Anchored in river about 200 yards from shore.)
Bonny ... ... 17th December.
Calabar ... ... 18th-19th December.
(Alongside wharf on 18th December.)
Oron ... ... 19th-20th December.
(Anchored in river about 200 yards from shore.)
Calabar ... ... 20th-21st December.
(Anchored in river about 300 yards from shore.)
Lagos ... ... 23rd-26th December.

The vessel was anchored at Wilmot Point more than a mile from the wharves and usual anchorages and from the native town.

On the 23rd, 24th, and 25th, three branch-boats were moored alongside at various times. Two of these were alongside at night.

On the 26th the ship crossed the bar and lay in the Roads.

The captain informed me that the patient did not go on board the branch-boats and that throughout the voyage he was ashore on only one occasion. This was at Oron, on 19th December (six days previous to the onset of his illness), from eight to ten o'clock in the evening, when he was on duty in a palm-kernel shed.

I was further informed that the deceased was on his second voyage to the West Coast of Africa ; that he always used a mosquito net, but was a non-quinine taker.

No other cases occurred on board the vessel during the four days she remained in Lagos Roads after the patient's death. She had, of course, been fumigated immediately after the case was diagnosed. Two mosquitoes were caught on the ship, but neither proved to be *Stegomyia fasciata*.

No cases occurred on the branch-boats which had been alongside.

It is to be presumed that the patient became infected ashore at Oron and (in the absence of European cases of the disease in that locality) from a native source.

Summary and Conclusions

1.—Thirty-three cases have been dealt with in this section. Six of these were natives of West Africa, the remaining twenty-seven were Europeans.

2.—Twelve out of the thirty-three cases were definitely diagnosed

as yellow fever. Of the remaining twenty-one cases, three—Nos. 17, 18, 19—are of a highly suspicious character; seven—Nos. 4, 6, 7, 11, 16, 25, 31—are certainly suspicious; Nos. 4, 6, 7, and 25, being of special interest as cases of hyperpyrexia (one of the subjects of inquiry of the Yellow Fever Commission); whilst the remaining eleven present suggestive features.

3.—In discussing the epidemiology of these cases they have all been assumed to be yellow fever.

4.—All except Nos. 15, 16 on the 'Lulu Bohlen,' Nos. 17, 18, 19 on the 'Thomas Holt,' and Nos. 27, 28, 29 on the 'Elizabeth Brock,' occurred as *single* cases. Two cases occurred on the 'Sandgrouse' dredger, but at an interval of three months.

5.—It is to be inferred that, at any rate, in the case of those ships where *single* cases occurred the patients were infected whilst ashore. Had the vessels themselves been infected it is hardly to be supposed that they would have presented only solitary cases of the disease. On small ships on which occurred cases 2, 3, 10, 11, 12, 13, 14, 21, 22, 23, 24, 30, there would be not less than three or four Europeans living in close association. On larger ships (not carrying European passengers), on which occurred cases 1, 4, 6, 7, 8, 15, 16, 17, 18, 19, 20, 25, 26, 27, 28, 29, 32, 33, there would be approximately eighteen or more Europeans. The exact numbers have been stated in those cases where it has been possible to ascertain them.

6.—If the patients on those ships where single cases occurred were infected ashore, their infection must, in the absence of European cases and excluding a possible animal reservoir, have been obtained from a native source.

7.—Now, as far as can be ascertained, none of these cases, with the possible exceptions of Nos. 6, 8, 20, could have become infected from a European source. Cases 1 to 11 occurred before any European case had been reported. Cases 15 to 19 (on vessels at Warri) occurred at least two months after the last European case was reported from Warri, and neither vessel had called at Lagos, where European and Syrian cases had been reported at intervals from May onwards. The ship on which case 17 occurred had called neither at Lagos nor at Warri. It is, however, possible that mild, atypical cases of the disease have occurred in Europeans and have

remained unrecognized, and therefore the possibility of contact with infective Europeans cannot be entirely excluded.

8.—The balance of evidence appears to point to the conclusion that the single and the first of the multiple cases which occurred on ships were infected from a native source. Support is given to this conclusion by the well-known fact that sailors live carelessly when ashore, and it will be remembered that, of the thirty-three cases described, twenty-six were European seamen of various grades.

9.—In no case is there evidence of the disease having been introduced into Nigeria from a neighbouring dependency.

The following is a list of the places in West Africa where yellow fever occurred in 1913:—

Grand Popo (Dahomey): Quarantine, 19th February—12th March.

Accra (Gold Coast): Quarantine, 15th March—14th April.

Warri (Nigeria): Quarantine, 13th June—30th June.

Accra (Gold Coast): Quarantine, 16th June—3rd July.

Lagos: Quarantine, 21st July—16th September.

Lagos: Quarantine, 4th October—5th November.

Single cases of yellow fever—quarantine not imposed—were reported from the following places:—

Saltpond (Gold Coast): 18th January. Occurred on s.s. 'Adansi,' lying in the Roads. Case imported from Nigeria.

Grand Popo—Agone (Dahomey): 2nd May.

Abokobi (Gold Coast): 14th May.

Quittah (Gold Coast): 2nd July.

Lome (Togoland): 13th September.

Forcados (Nigeria): 20th October.

Lagos: 26th November. Occurred on s.s. 'Bassa.'

Lagos: 24th December. Occurred on s.s. 'Montenegro.'

Lagos: 28th December. Occurred on s.s. 'Nyanga.'

Appendix I

Case A

Race : European.
Age : —.
Sex : Male.
Occupation : Clerk.
Date of admission to Warri Hospital : 15th October, 1912.
Date of discharge : 19th October, 1912.
Diagnosis : Febricula.

Copy of notes on the case.—' Blood examination negative. Bowels well opened before arrival. Patient is a non-quinine taker. Admitted day after onset. Nothing apparently wrong save rise of temperature ; tongue clean ; no aches or pains ; no suffusion of eyeballs ; is it malaria ? is it sand-fly fever ? '

The patient was treated with quinine, 5 grains four-hourly, for two days, and then thrice daily. He also received one hypodermic injection of quinine. He was again admitted for the same condition on the 11th January, 1913, and discharged on the 18th January. The blood examination was again negative. He received a hypodermic injection of quinine on admission, and subsequently Quin. Hydrochlor., 5 grains (three doses), on the 12th, 2½ grains four-hourly on the 13th and 14th, and 2½ grains three times a day on the 15th January.

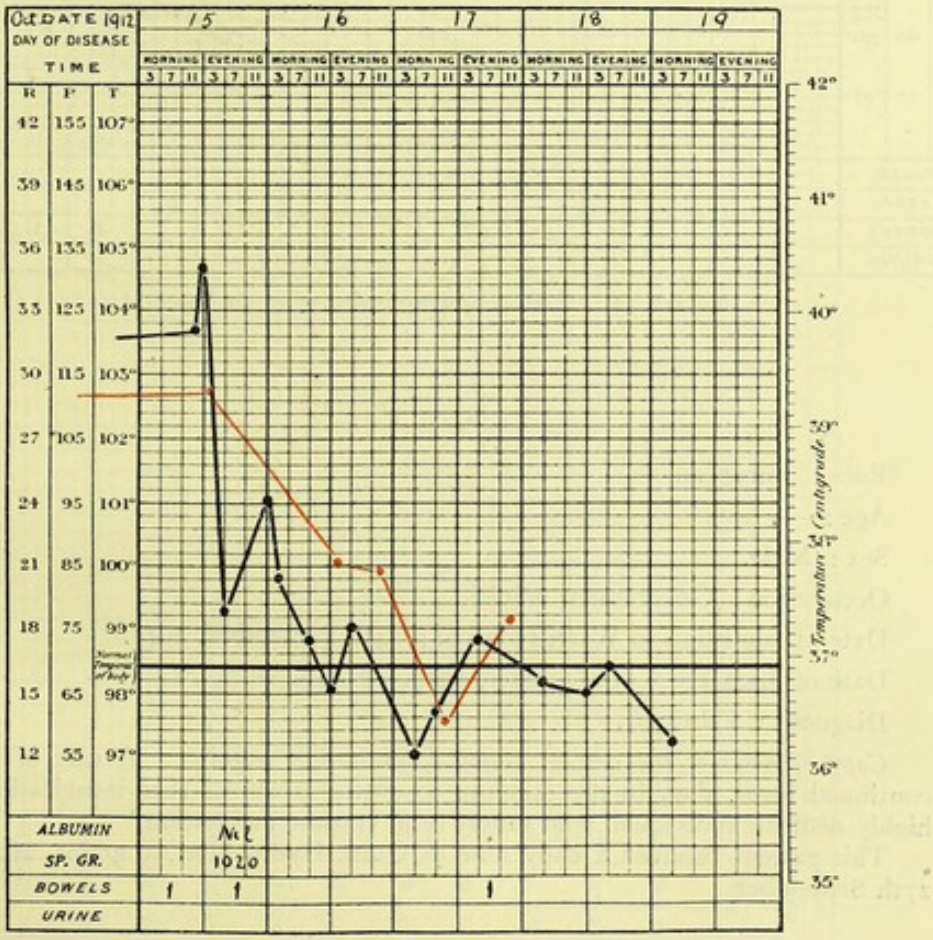


Chart 74

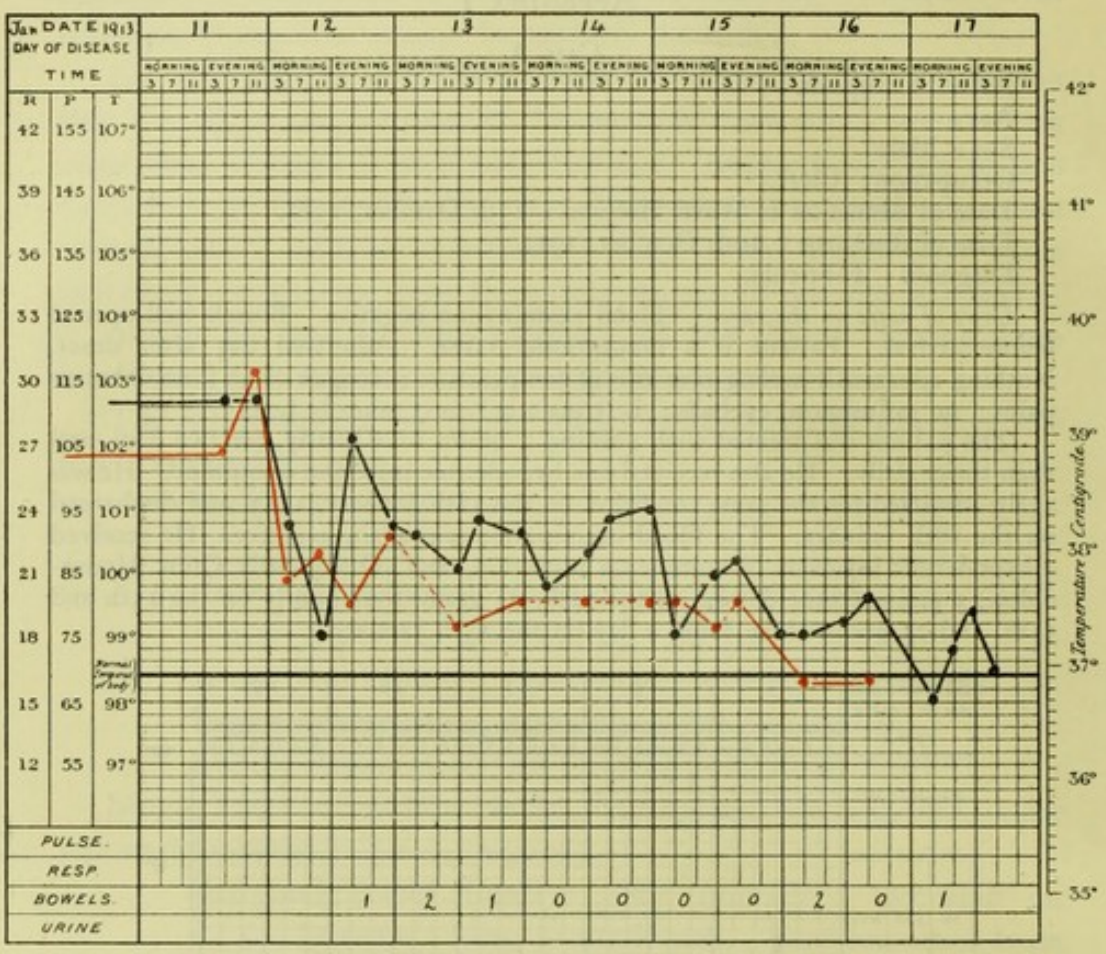


Chart 75. Case A, second admission to hospital

Case B

Race: European.

Age: —.

Sex: Male.

Occupation: Government official.

Date of admission to Warri Hospital: 24th September, 1912.

Date of discharge: 5th October, 1912.

Diagnosis: Febricula.

Copy of notes of the case.—'Blood examination negative. A case of simple continued fever, due, in my opinion, to gastro-intestinal auto-intoxication. A highly neurotic individual, who suffers from chronic indigestion.'

This patient received a daily dose of Quin. Hydrochlor., 5 grains, after the 27th September.

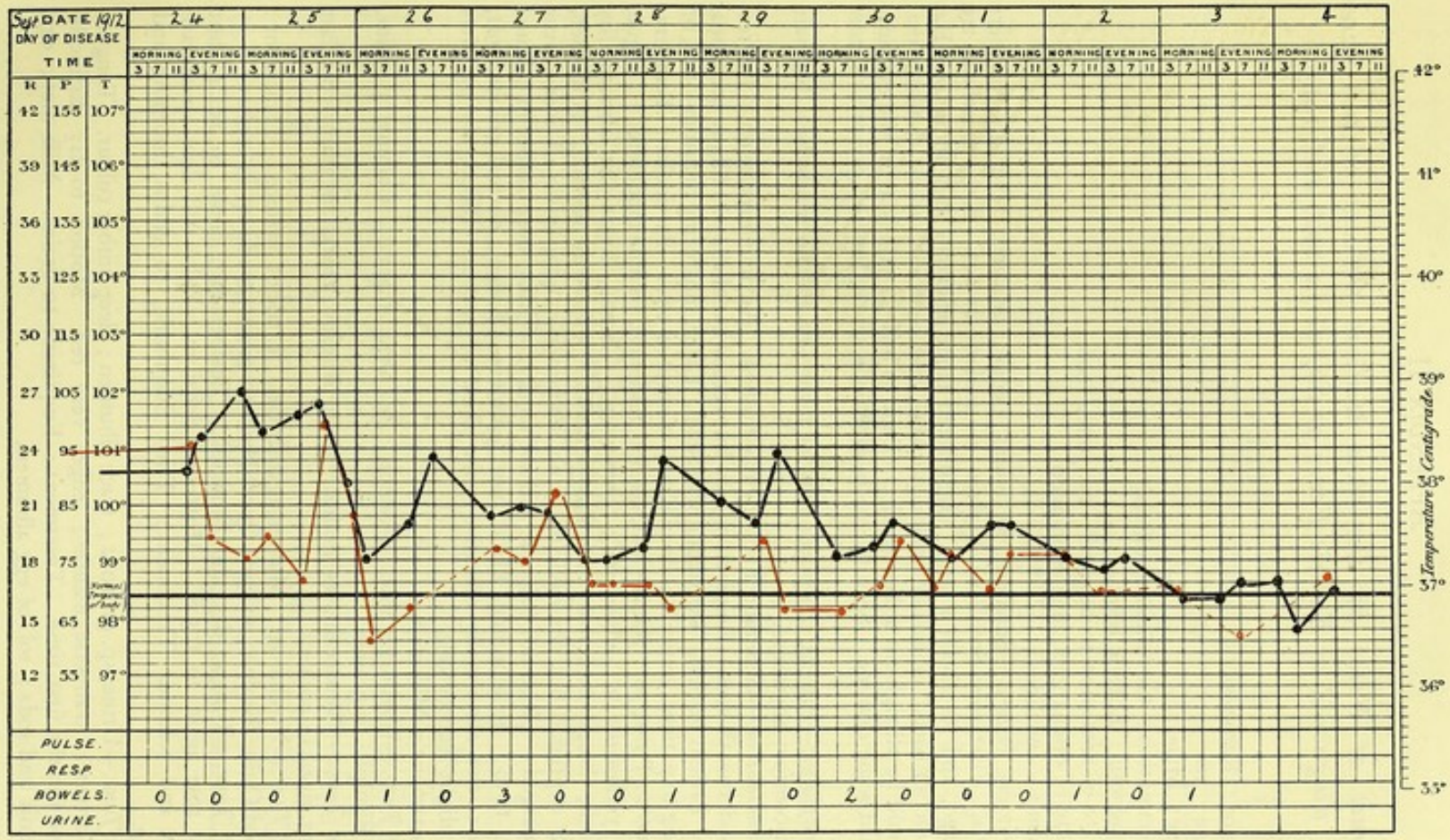


Chart 76. Case B

Appendix II

Extract of Notes by the then Medical Officers of two cases diagnosed as Enteric Fever at Sapele in 1906 *and* 1913

Case 1

Race : European.
Age : 28.
Sex : Male.
Occupation : Government official.
Diagnosis : Enteric fever.
Date of admission to hospital : 1st June, 1906.
Date of discharge : 28th July, 1906.
Result : Invalided.

Previous history.—Smallpox in Sierra Leone. Malarial fever in Northern Nigeria. First tour Southern Nigeria—no malaria as yet. Some diarrhoea ten days ago, and for about a week has suffered from headache and anorexia. Has felt 'out of sorts,' especially since 29th May, but continued work, thinking that he would be all right in a day or two. Took to bed on 31st May in the evening, and had some quinine. Seen by me in afternoon of 1st June on my return from Koko.

Complaint.—Patient complains only of fever—he has no headache. No pain nor discomfort anywhere.

Examination.—General : Face slightly flushed. Anxious expression. Depression underneath eyes. Respiration easy but somewhat shallow. Slight occasional cough. Patient restless. Twitching of muscles. Later, muttering delirium—but, on speaking to patient, sensible answer after a minute or two. Particular : Temperature 106°. Pulse, 76. Radials soft, tension moderate, volume moderate. Tongue, thick, yellowish fur, edges red ; tremulous. Thorax, heart—no abnormality detected ; lungs, expiratory murmur noticeable, otherwise normal. Abdomen, slightly depressed but not navicular ; no tenderness ; tympanitic all over ; liver not enlarged ; spleen not palpable and *not* tender. Urine, deep amber in colour : sp. gr. 1030 ; no albumen, blood, nor sediment. Faeces, normal colour, soft, formed ; not abnormally offensive ; no blood or mucus. Blood, no parasites seen ; slight leucocytosis.

Treatment : Milk diet.

1st June.—Warburg's tinct. ½-ounce. Pil. Opii. 1 grain. Calomel 3 grains. Quin. Bisulph. 10 grains.

2nd June.—Phenacetin, 15 grains. Quin. Bisulph. (total 20 grains) the last 5 grains given in cachet.

3rd June.—No change. Muttering delirium. Little or no sleep. Treatment : Vomited Quin. Bisulph., so gave Quin. Hyd. 10 grains, made up in cachet.

4th June.—Tongue dry and brownish. Temperature down to 102·4° but rapidly rose again to 105·8°. Muttering delirium. Pulse still slow—moderate tension and volume. Treatment : Tried Euquinine, 10 grains, morning and evening.

5th June.—Urine, sp. gr. 1022 ; trace albumen ; deep amber colour. Tongue, dry ; brown ; tranverse fissures ; edges very red. Motion to-day distinctly offensive for the first time. Treatment : Euquinine 10 grains. Milk diet ; egg flip ; milk and soda ; sol. of egg albumen.

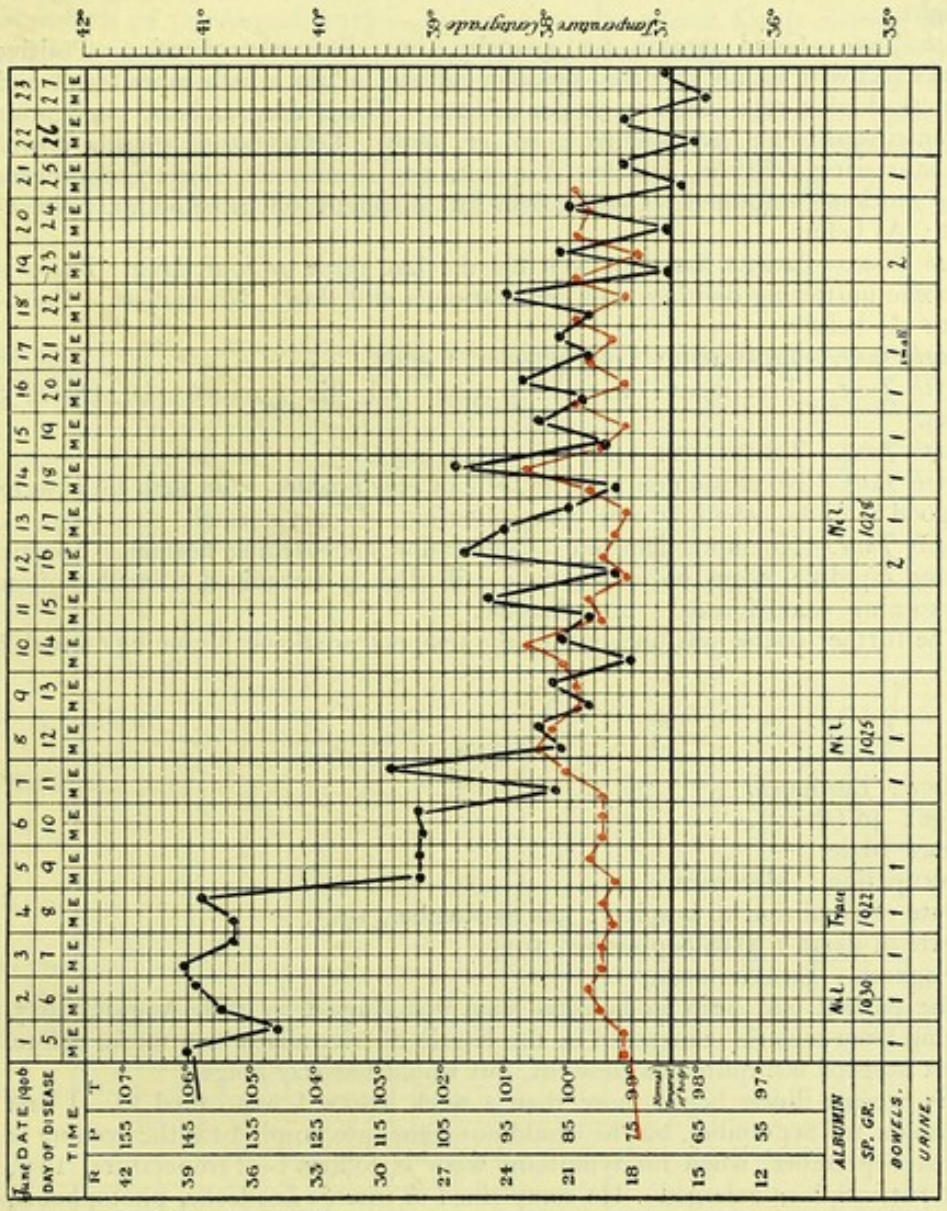


Chart 77. Case I

6th June.—Temperature between 102° and 103° all day. No other change. Still delirium. No motion. Little or no sleep. Possible typhoid. Less possibly tubercular. Treatment: Diet continued as before. Given a mixture containing Liq. Hydrarg. Perchlor., Quin. Hydr., Tr. Card. Co.

7th June.—Dr. Roe arrived. Saw patient with me and declared for typhoid. Motion slight and constipated. Treatment: As before. Grey powder, 1 grain, at night.

8th June.—Good motion for quantity, but distinctly offensive. Positive Widal's test with locally prepared bouillon culture. Pulse a little more feeble and distinctly higher rate—highest 90 per minute. Urine, deep amber; no deposit on centrifugalizing; no albumen; sp. gr. 1028. Temperature coming down. Still muttering delirium, but less frequent, and cerebration slightly improved. Large motion—unformed. Good colour but distinctly offensive odour. Treatment: As before.

9th June.—Patient has slept well for the last three or four days. There is still some muttering delirium and cerebration is still slow. No motion. Treatment: As before.

10th June.—Treatment: Grey powder, 1 grain.

11th June.—Treatment: Rectal injection. Ol. Ric. ½ ounce. Ol. Olivae 5 ounces.

12th June.—Treatment: Grey powder, 1 grain.

13th June.—No motion on 10th, in spite of grey powder. On 12th there were two good motions—the first only being offensive. Urine, normal.

14th June.—No more delirium. Cerebration approaching normal. Tongue cleaning rapidly; edges no longer red; still slightly tremulous. Small motion this morning—semi-formed; not offensive.

The further course was uneventful, the temperature slowly becoming normal.*

Case 2

Race: European.
Age: 40 (about).
Sex: Male.
Occupation: Merchant.
Date of admission to hospital: 5th September, 1913.
Date of death: 11th September, 1913.
Diagnosis: Enteric fever.

The patient had been in hospital from 7th August to 18th August, 1913, suffering from malaria contracted in the Kwale district about two weeks before. He left hospital not quite convalescent, but would not stay longer.

His present illness began more than a week before I was called in. I first saw him on 3rd September, but he would not come into hospital till the evening of the 5th September, when his symptoms were as follows:—Temperature, 103°, pulse, 104. Spleen enlarged. He complained of intense headache, photophobia, sleeplessness, and no desire for food of any sort. Tongue furred. Pupils dilated.

He had been dosing himself with quinine for some time, and was in a very weak state. He was also constipated. Three days before death delirium of a quiet sort set in—it seemed as though his mental powers were dulled. On the day

* *Note.*—At the time of onset of the patient's illness, he had been in Southern Nigeria nearly five months.—E.J.W.

of his death he passed into a state of unconsciousness about 2 p.m. and passed his urine and faeces involuntarily. He also showed marked nervous symptoms, twitching of the fingers, etc., and died at 7 p.m. There was no distant abdominal rash. The urine was albuminous. Treatment: Fluid diet. Quinine by the mouth. Arsenic. Saline aperients.

The following is an extract of the notes of the case when previously admitted for malaria on 7th August, 1913:—Patient came down from Kwale district, where he had been ill for more than a week. He had been dosing himself heavily with quinine. On admission his temperature was 101·2°. Pulse, 96. Tongue moist and slightly furred in the centre. Spleen, enlarged. Liver, normal. Skin, dry. Bowels, constipated. In spite of all treatment his temperature remained above normal until the eighteenth day, and then he insisted on leaving the hospital. Treatment: Quinine hypodermically and by the mouth. Saline aperient, etc.*

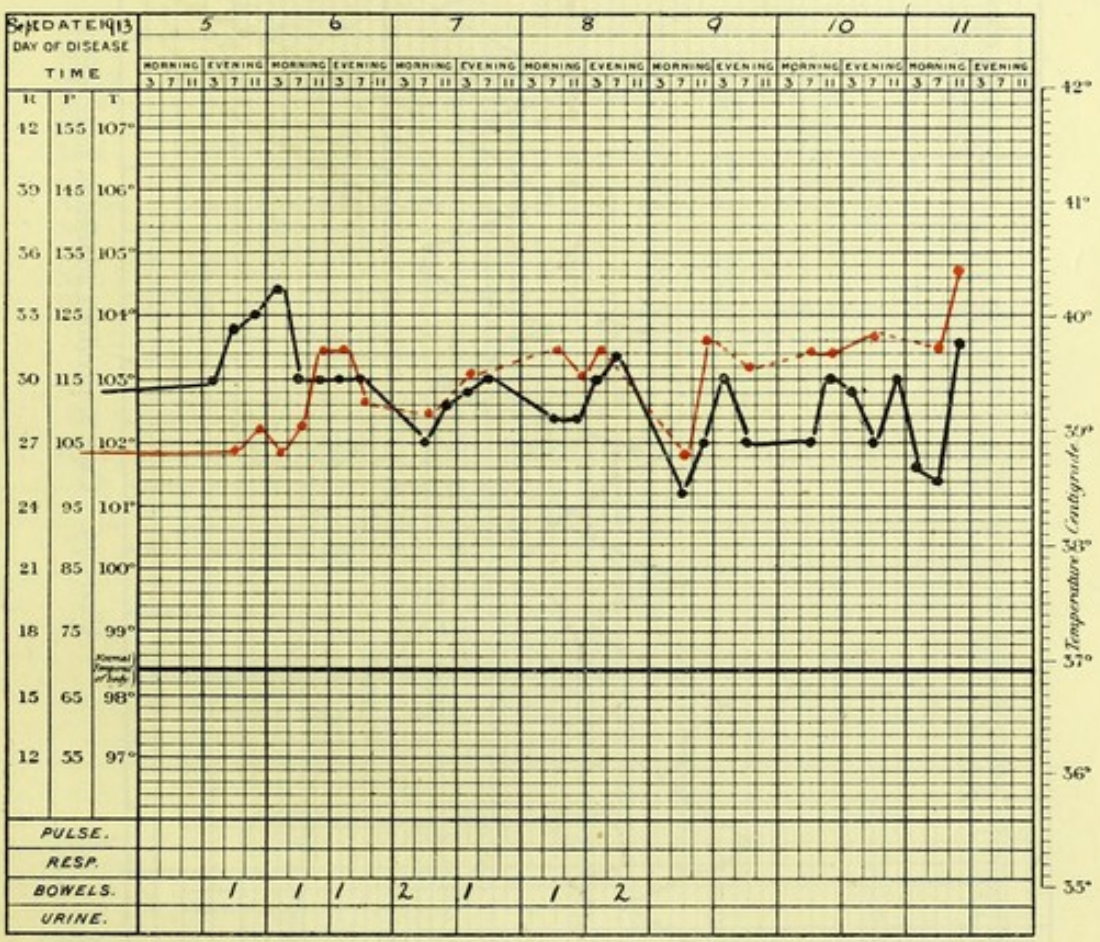


Chart 78

* *Note.*—At the time of the patient's admission to hospital on the first occasion (7th August) he had been in Southern Nigeria between five and six weeks.—E.J.W.

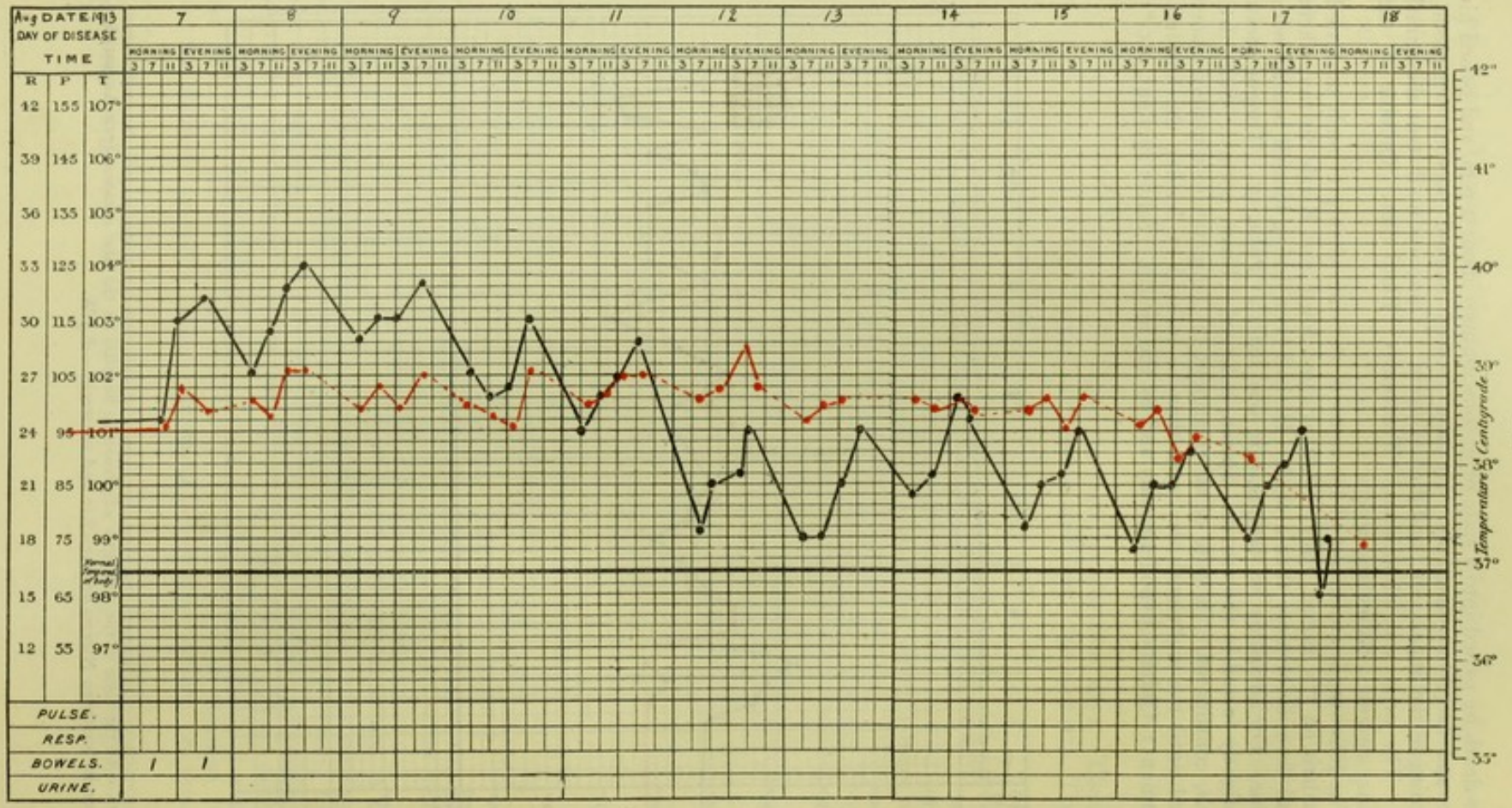


Chart 79. Case 2, previous admission to hospital

Appendix III

Record of Rainfall and Temperature Observations at Warri

	1911				1912				1913			
	Inches of Rain	Shade Maximum Temperature	Shade Minimum Temperature	Range of Temperature	Inches of Rain	Shade Maximum Temperature	Shade Minimum Temperature	Range of Temperature	Inches of Rain	Shade Maximum Temperature	Shade Minimum Temperature	Range of Temperature
Jan. ...	4·22	96	65	25	1·60	98	69	29	Nil	95	65	30
Feb. ...	1·48	94	60	34	1·50	98	69	29	2·42	95	68	27
March ...	8·52	95	75	20	4·17	99	68	31	4·25	96	68	28
April ...	15·32	94	69	25	10·91	95	69	26	6·10	95	68	27
May ...	14·37	94	69	25	8·51	96	68	28	8·85	95	68	27
June ...	12·92	90	69	21	12·99	90	68	22	9·57	93	68	25
July ...	20·40	87	69	18	23·90	86	68	18	17·64	88	71	17
August ...	4·89	85	67	18	14·50	90	69	21	38·95	89	65	24
Sept. ...	17·52	88	68	20	13·43	87	68	19	19·55	89	68	21
Oct. ...	16·55	92	69	23	15·80	92	68	24	—	—	—	—
Nov. ...	2·74	98	70	28	4·40	94	68	26	—	—	—	—
Dec. ...	Nil	95	64	31	Nil	92	65	27	—	—	—	—

Appendix IV

Record of Rainfall and Average Maximum Temperature in Shade at Forcados

	1911		1912		1913	
	Average Maximum Shade Temperature	Inches of Rain	Average Maximum Shade Temperature	Inches of Rain	Average Maximum Shade Temperature	Inches of Rain
	Degrees		Degrees		Degrees	
January ...	96	6·8	91	2·1	93	Nil
February ...	99	2·9	92	1·9	93	7·8
March ...	104	10·25	94	8·8	92	5·56
April ...	100	11·8	95	17·6	92	10·0
May ...	99	13·8	92	16·2	93	20·7
June ...	97	14·2	91	17·3	89	24·1
July ...	94	17·0	89	21·3	82	49·4
August ...	90	0·5	86	19·3	82	39·2
September ...	84	17·0	91	20·7	—	—
October ...	86	24·9	94	27·0	—	—
November ...	89	4·4	89	14·1	—	—
December ...	89	4·8	75	1·4	—	—

Appendix V

Report on the Examination of Organs from Case L. 26*, by Hubert M. Turnbull, M.D., *Director of the Pathological Institute of the London Hospital.*

Macroscopic Examination

Liver. The portion of liver is a slice 6 cms. long, 3·5 cms. broad and 1·0 cm. thick. The capsular surface is smooth. The capsule is flat, thin and transparent, showing a pale yellowish surface, dotted with darker, grey, pin-point areas which give a lobular pattern. The cut surface is of the same pale yellowish colour; on fresh section, however, it is pale green. Minute, greyish portal systems give an apparently normal lobular pattern.

Kidney. A wedge-shaped portion of kidney, having an outer surface measuring 9 by 3·5 cms. and a depth of 2 cms.

The thin capsule has been to a large extent removed. The exposed surface is smooth, of a faintly yellow colour, mottled by darker lines, presumably engorged vessels. On the cut surface the cortex bulges above the level of the medulla and the demarcation between the two is sharp. The cortex has a yellowish grey colour, and on fresh section a faint greenish tint. The pattern is obscure, but can be recognised by the darker colour of the glomeruli in the labyrinths. The cortical pattern is quite straight. The medulla is of a dark slate colour with very dark brown vasa recta. The arcuate vessels are small.

Spleen. A slice of spleen 8 cms. by 3 cms. and 1 cm. thick. The capsule is thin and wrinkled. The cut surface has a ragged appearance suggesting sodden twine, and is of a grey colour. On fresh section the cut surface shows immediately below the capsule a zone, 2 mms. wide, in which there is a pattern formed by white trabeculae in a dark red ground. All the remainder of the freshly cut surface is of a uniform, dirty red colour, smooth and without pattern. These peculiarities are obviously due to the fixatives not having at first permeated the central portions of the spleen.

* For clinical notes of this case see page 45.

Stomach. The segment of stomach includes 11 cms. of lesser curve and some 22 cms. of greater curve. The cardia is present and has been ligatured. The other extremity appears to have been cut off in the region of the pyloric antrum. A small portion from the cardiac end has been removed, after fixation, presumably for microscopic purposes. The peritoneal surface is for the most part smooth and glistening, in places the lustre is lost, but there is no recognisable deposit of fibrin. The stomach is contracted, the mucosa being thrown into rugae. In the cardiac half of the segment the mucosa is of a deep black colour; in the pyloric half it is almost pure white. The mucosa appears throughout to be swollen, and is slightly mammillated. There are no erosions, nor ulcers.

Microscopic Examination

The tissue was in spirit on receipt. The sections showed, however, that it had at one time been immersed in formalin, a precipitate characteristic of the latter having formed in haemorrhagic areas.

Portions of the above organs were (1) placed in formalin, cut upon the freezing microtome and stained with sudan III and Nile-blue-sulphate; (2) placed in 90 per cent. alcohol, embedded in paraffin, and stained by Ehrlich's haematoxylin and eosin, Weigert's iron-haematoxylin and van Gieson, lithium-carmin and Weigert's elastin stain (Hart), Unna-Pappenheim's stain, Jenner's stain for the demonstration of cellular granules (unpublished method), Twort's stain and the Weigert-Gram method for the demonstration of bacteria, and the Turnbull's blue method for the demonstration of free iron.

Liver. The capsule is thin and even, the lobulation is normal. The fibrous tissue of the portal systems and hepatic veins is not increased.

The majority of the portal systems show a considerable infiltration. The infiltrating cells are lymphocytes and larger, mononuclear, 'free endothelial cells' such as are described in detail in the case of the spleen. Some of these 'free endothelial cells' show karyokinetic figures.

The larger bile ducts contain a few threads of albuminous substance and occasional desquamated cells. A few small droplets of fatty substance are rarely found in the epithelium of the ducts.

There is no abnormality in the structure of the vessels except the presence of a few granules of fat in the cells of the media of many hepatic arteries.

The parenchyma is the seat of conspicuous degeneration. The hepatic cells are greatly swollen, and the capillaries appear to be completely occluded or are only recognised as narrow clefts. In only a few areas are red corpuscles seen in the capillaries. In paraffin sections stained in haematoxylin and eosin, there is usually a zone, two to four cells broad, immediately round the portal systems, in which the cells retain a polygonal shape, are for the most part free from vacuoles and have sharply stained nuclei. Internal to this there is a broad zone in which the protoplasm of the cells contains clear vacuoles of various sizes and is to a greater or less extent hyaline and deeply eosinophil. In the majority of the cells there are no nuclei; in others very faintly stained swollen nuclei can just be recognised. Other nuclei are shrunken and deformed; chromatolysis is, however, much the commonest expression of nuclear degeneration and necrosis. Where the cells can be differentiated they are rounded in shape; in this zone, however, it is usually impossible to differentiate individual cells or even cellular columns. In approximately the central half of the lobules the cells are to a large extent rounded and show a varying degree of vacuolation and hyaline, eosinophilic degeneration of their protoplasm, and chromatolysis, but these changes are much less severe, so that the cellular columns and individual cells can be differentiated. Within the columns of this zone there is a considerable amount of bright yellow bile-pigment.

In sections stained with sudan the outer half of the lobules, with the exception of the narrow zone in the extreme periphery described above, is occupied by a large quantity of fatty substance. The fat does not form large, round droplets which evenly distend signet-shaped cells. The bulk of it is in the form of medium-sized, deeply-stained droplets which lie in groups within degenerate cells. Fine intracellular granules are also present. Occasional large masses of round or irregular shape are extracellular, and obviously

formed by the disintegration of cells. In the central half of the lobules there is much less fat, it is intracellular and in the form of small granules of 'dust.' In sections stained by Nile-blue-sulphate, less fat is demonstrated than in sudan; the smallest granules are not stained; the fat, almost without exception, gives the pink reaction of neutral fat. In preparations of cells crushed in water or in acetic acid and examined with a polarisator very small doubly-refractile bodies are present.

In sections subjected to Turnbull's blue reaction, granules of iron pigment are demonstrated within many of the cells throughout the lobules. The granules are most abundant within the zone of healthier cells in the extreme periphery of the lobules.

Granules of bile pigment are present in the majority of the cells, and are most abundant in the cells of the centre of the lobules.

The kidney. The interstitial tissue is slightly swollen by oedema. The capillaries, particularly those in the medulla, are engorged. The media and intima of the arteries are not altered.

The glomerular tufts are engorged, the cells lining Bowman's capsule are frequently swollen and occasionally desquamated or disintegrated.

The cells lining the first convoluted tubules are greatly swollen, ill-defined, finely granular and faintly eosinophil. Only an occasional cell in any section of a tubule contains a nucleus. Stages of chromatolysis are seen in these tubules. The lumina contain a finely granular débris which resembles the protoplasm of the cells.

The epithelium of the ascending loops of Henle occasionally shows similar degeneration and necrosis, and bile pigment is present in some of the cells.

There is much desquamation of the cells of the second convoluted tubules and small collecting tubules; the cells are well defined and brightly stained, so that they contrast sharply with those of the first convoluted tubules. In some of the cells of the second convoluted tubules there are small fatty granules which are stained by sudan and give a pink reaction in Nile-blue. The tubules contain masses of homogeneous and granular, occasionally deeply eosinophil, substance.

In some of the large collecting and discharging tubules there are

homogeneous and granular casts. The casts in the second convoluted, large collecting and discharging tubules are Gram-positive. Iron-pigment is not demonstrated by the Turnbull's blue method.

There is no evidence of inflammatory reaction on the part of the cells of the blood or fixed tissues.

The spleen. The red corpuscles are laked, except in the narrow external zone, in which complete fixation was noted on macroscopic examination. The laking is, therefore, evidently due to improper fixation. There is much precipitation of formalin-pigment.

There is no abnormality in the structure of the capsule, trabeculae, arterioles or veins.

The Malpighian bodies are numerous and of considerable size. They have no 'Germ centres.' They contain in addition to lymphocytes an increased number of cells which, in default of any generally accepted name, will be referred to here as 'free endothelial cells.' These cells are approximately round and occupy an area equal to from three to four and a half red corpuscles. The protoplasm is non-granular and basophil. The nucleus occupies half or more of the cell. The chromatin is arranged as a, usually wide-meshed, net of narrow rods, and is also massed as a stout capsule round each of the three or four large nucleoli. The sharply defined nuclear membrane and the chromatin are deeply stained and contrast with the pale nucleoplasm.

The pulp is greatly engorged. The pulp strands between the capillary veins are narrow, and the fibrils and fixed cells of the reticulum thereof are not increased. There are many free cells in the pulp in addition to the red corpuscles. The free cells lie both in the pulp strands and in the capillary veins, especially in the latter. Among the free cells there are numerous 'free endothelial cells' such as have been described above. Many show karyokinetic figures. There are several giant cells which have two to seven large oval nuclei occupying almost the whole of their non-granular, basophil protoplasm. Where several nuclei are present they are superimposed. Some of these large cells have a single, ribbon-like, deeply stained nucleus, and suggest megakaryocytes. The protoplasm, however, in Jenner's stain is more basophil than that of the megakaryocytes of marrow. The giant cells

appear to be multinuclear derivatives of the 'free endothelial cells.' Large and small lymphocytes are numerous; neutrophil leucocytes are relatively few in number. There are a very few necrosed, swollen vacuolated cells. Eosinophil leucocytes, plasma cells and myelocytes were not found.

There is a considerable number of coarse granules of iron pigment (Turnbull's blue) in the spleen. The granules are usually intracellular.

Granules of fat were not found in any of the cells in sections stained by sudan.

There are no organisms in sections stained by the methods of Twort or Weigert-Gram.

Stomach. A. In a section taken near the pyloric extremity of the portion of stomach the glands are lined by 'chief cells' and 'parietal cells'; the latter are very abundant. The 'chief cells' are rounded, granular or vesicular, and to a large extent desquamated. There is a little mucus in the cells lining the glandular crypts. The interglandular stroma is very scanty and is free from infiltration. There is engorgement of the veins and capillaries in the submucosa. In sections stained by sudan the parietal cells are stained diffusely, and some also contain a few brightly stained granules of fat.

B. In sections from the cardiac end, the mucosal glands contain parietal and chief cells. The latter are rounded, granular or vesicular and frequently desquamated. The capillaries in the submucosa and mucosa are greatly engorged. In the mucosa the engorgement is extreme, and there are extensive extravasations of blood. The epithelial lining of the tubules in most of the mucosa is separated widely from the intertubular stroma by oedema. The superficial third or more of the mucosa is necrosed in the areas of severe haemorrhage. The bundles of the muscularis are separated by oedema. There are some bacilli and cocci upon the surface of the mucosa.

[The following remarks on his examination of specimens in this case and that of Case L. 14 (p. 219) were appended by Dr. Turnbull to his report on the latter examination. They are inserted here for convenience.]

Summary and Analysis of Histological Abnormalities

Case L. 26 (pp. 45 and 196). The *liver* is the seat of a very severe parenchymatous degeneration and necrosis, in which an accumulation of fat is the most important feature and a hyaline alteration of the protoplasm is conspicuous. A narrow zone of hepatic cells immediately round the portal systems is almost intact, the external half of the remainder of the lobule is much more severely affected than the central. The degenerate and necrosed cells compress and appear to constrict to capillaries. There is icterus and an accumulation of granules of iron pigment. There is no evidence of inflammatory reaction except an infiltration of the portal systems, which in its cytology resembles the infiltration found in the spleen.

The *kidney* also is icteric and shows extensive necrosis and parenchymatous degeneration. Necrosis of the first convoluted tubules is extreme and dominates the picture. Fatty degeneration is slight, and is confined to the second convoluted tubules. Casts are present. There is no accumulation of iron pigment. There is no evidence of inflammatory reaction in the form of emigration of cells from the blood or proliferation of cells in the interstitial tissues.

The *spleen* is engorged and is the seat of a cellular infiltration of well-defined character. In this an increase in leucocytes takes very little, if any, share; the characteristic of the infiltration is a proliferation of 'free endothelial cells.' These cells are present in considerable numbers in the Malpighian bodies and are very numerous in the pulp. Giant and multinuclear examples are conspicuous. The occurrence of karyokineses bears witness to the activity of the proliferation. There is a considerable deposit of iron pigment in the spleen.

In the *stomach* there are engorgement, oedema, slight parenchymatous degeneration and, in the mucosa of the cardiac portion, most extensive haemorrhages which have led to necrosis. There is only a trace of fatty degeneration in the parenchyma, in some of the parietal cells. There is no inflammatory infiltration, nor proliferation of the interstitial tissue.

In the media of some of the *arteries* within the above organs there is a slight fatty degeneration.

Case L. 14 (p. 219). In the *liver* there is a slight portal fibrosis. The dense and sclerotic nature of the fibrous tissue excludes recent activity of the process; the fibrosis bears no constant relation to an infiltration which resembles that in Case L. 26 and which is only found in some of the portal systems. The slight portal fibrosis is evidently an accidental complication. The other histological changes differ from those in Case L. 26 in intensity alone. The degeneration and necrosis are greater, and the central portion of the lobules is as severely affected as the intermediate. There is a greater accumulation of iron pigment.

The changes in the *kidney* only differ in detail from those in Case L. 26. Necrosis of the parenchyma is much less marked, and there is a corresponding increase in the expressions of degeneration. Thus fatty degeneration is much more marked in the second convoluted tubules, and is found also in the loops of Henle and collecting tubules. Casts of albuminous, fibrinoid substances, especially a deeply eosinophil hyaline substance, are very numerous. As in Case I, there is no evidence of inflammatory reaction, so that the term 'nephritis' is not justified.

In the *spleen* the pathological condition is essentially similar to that in Case L. 26. The proliferation of the 'free endothelial cells' in the Malpighian bodies is much greater, and has led to a decrease in their lymphocytic content; the bodies appear, therefore, smaller, and their borders are ill-defined. In the pulp there are very large numbers of the free endothelial cells, but they have almost all become vacuolar, often necrosed, phagocytes.

In the *small intestine* there are congestion, a general infiltration of the mucosa and focal necroses in the mucosa. The general infiltration of the mucosa, and especially the numbers of neutrophil leucocytes therein, are evidence of inflammation. The focal nature of the necroses of the mucosa points to their having occurred before death; the absence, however, of any zone of inflammatory reaction round them indicates that they were agonal.

In the *lung* there is extensive extravasation of blood. The alterations, however, in this blood, the general pyknosis of nuclei, and the eosinophilia and yellow discoloration of the tissue, in conjunction with the masses of bacteria of different kinds in the air passages, form a picture which is characteristic of haemorrhage due

to acid digestion from agonal aspiration of stomach contents. Such agonal, acid digestion is so commonly associated with cases in which there has been vomiting during life, for instance peritonitis, that its presence in this case may perhaps be regarded as slight evidence of a disease associated with vomiting.

Clumps of *bacteria* are present in the liver, kidney, small intestine and lung in Case L. 14. Their great variety and their absence from Case L. 26 exclude their being the causal factor of the histological changes. The absence of any reaction round the masses points to the infection being agonal. As regards their source, reasons have been given for supposing those in the lung to have been inspired with stomach contents. Those in the necrosed mucosa of the intestine are similar to the bacteria usually found within the intestine, and have doubtless been derived from the intestinal lumen. The morphological characters of those in the liver and kidney also point to the intestinal wall as the portal of infection.

Significance of the Differences in the Two Cases

Death appears to have occurred at an earlier stage of the disease in Case L. 26, and the earlier onset of death was perhaps due to the rapid and extensive necrosis of the kidney. Thus in Case L. 14 the affection of the liver is severer, and when compared with Case L. 26 appears to have advanced towards the central veins. In the kidney degenerations are much more conspicuous, and there are greater accumulations of casts; the parenchymatous degeneration appears to have had longer time to develop. In the spleen the proliferation of endothelial cells is greater and the cells have become phagocytes.

Comparison with the lesions of Yellow Fever described in the literature

The general features of the pathological changes in yellow fever, as described in the literature to which I have had access (vide infra), are found in the two cases under discussion. These general features are:—Icterus. Severe parenchymatous degeneration and necrosis of the liver, in which fatty degeneration plays the most

conspicuous rôle. A variable degree of parenchymatous degeneration and necrosis of the kidney; in which fatty degeneration may be very slight. Engorgement and haemorrhage in the intestine, the haemorrhage being greatest and usually very conspicuous in the stomach. A variable degree of inflammation and necrosis of the mucosa of the intestine. Engorgement of the pulp of the spleen. No constant, nor characteristic change in the lung.

Further, such details as are given in the descriptions of the histological changes are almost all found in the two cases under discussion. Thus in the liver, Carroll (1905) describes a zone of cells round the portal systems in which degenerative changes are slight. He specially mentions a hyaline, deeply eosinophil, necrosis of the hepatic cells. Marchoux and Simond (1906) describe compression of the capillaries by swollen hepatic cells in cases in which death occurs between the fifth and tenth day. Carroll says that this compression is so constant and peculiar a feature that it can indeed be considered as characteristic of the disease. It may, however, be found in other diseases.

The microscopic pictures of the kidneys in Cases L. 26 and L. 14 are to be found in those enumerated by Carroll.

I can find no description of the cytological changes in the spleen in yellow fever. All authors mention congestion. Marchoux and Simond say that the Malpighian bodies are reduced in volume and appear dissociated (cf. Case L. 14, p. 220).

In the mucosa of the stomach Marchoux and Simond found fatty degeneration in the parietal cells alone.

In the intestine, the same researchers found no fatty degeneration of the epithelium of the glands (others, however, quoted by Otto, are said to contradict this). Marchoux and Simond lay stress on a separation of the epithelium from the villi of the small intestine by oedema, similar to that present in the stomach of Case L. 26.

The occasional presence of masses of bacteria in the organs is described. Thus Carroll mentions it as a phenomenon in the kidney, and ascribes it to secondary infection from the intestine.

The only detail mentioned which was not observed in Cases L. 26 and L. 14 is fatty degeneration of the endothelium. Stress is laid by Marchoux and Simond on the occurrence of this in the liver and spleen. Some fat was certainly found in the phagocytic endothelial cells in the spleen of Case L. 14; a little fat was also

found in the media of arteries in different organs. In this connection it must be remembered that the tissue of Cases L. 26 and L. 14 had been preserved in a 90 per cent. solution of alcohol.

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FIG. 1. Forcados. A main road.

The photograph illustrates (I) the manner in which the roads are raised above the general swamp level; (II) a tidal ditch.

It is by means of an intersecting system of such ditches that the swamp is drained.

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FIG. 2. Forcados. Native hospital and swamp—wet season.

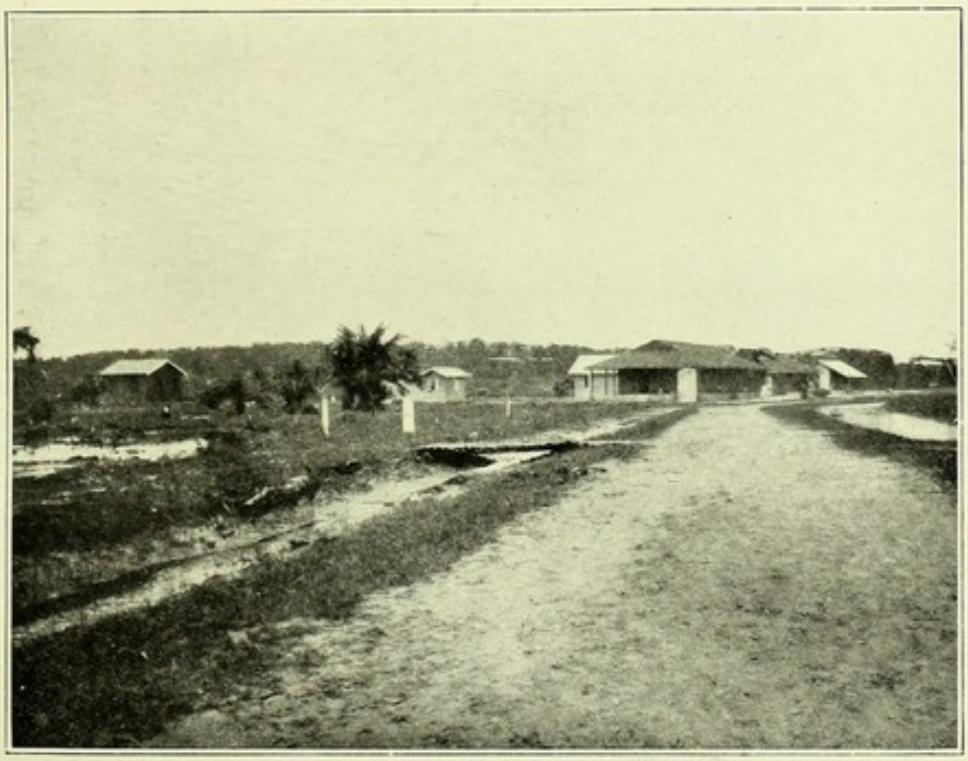

FIG. 3. Forcados. Native hospital on right. Isolation block on extreme left. The swamp shewn in Fig. 2 is here seen on the left. Tidal ditches are seen on either side of the road.

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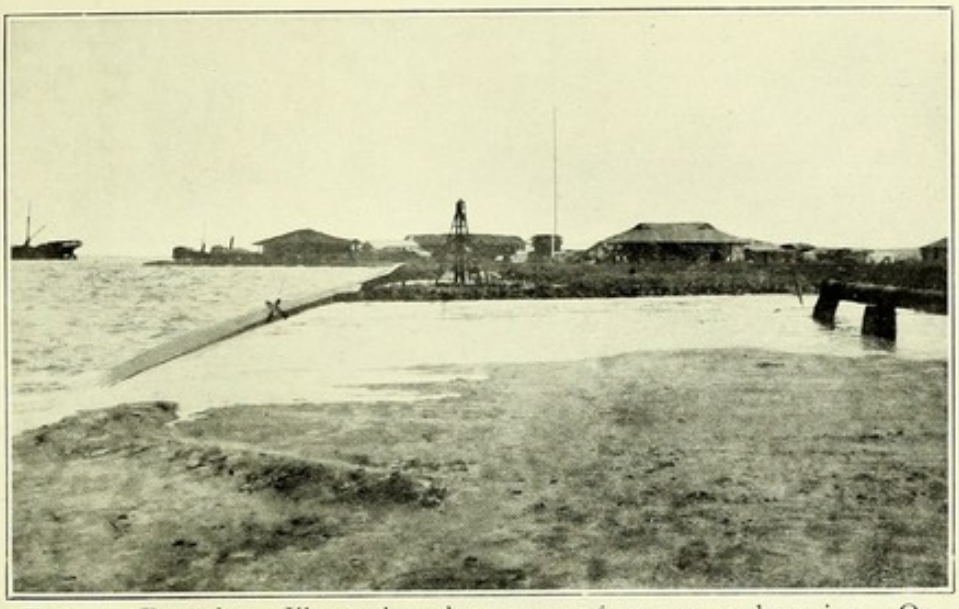

FIG. 4. Forcados. Illustrating the system of swamp reclamation. On the right is seen the pipe through which sand is being pumped from the sea. The water pumped up with the sand, drains back into the sea, encroachment from which is prevented by the concrete wall (x).

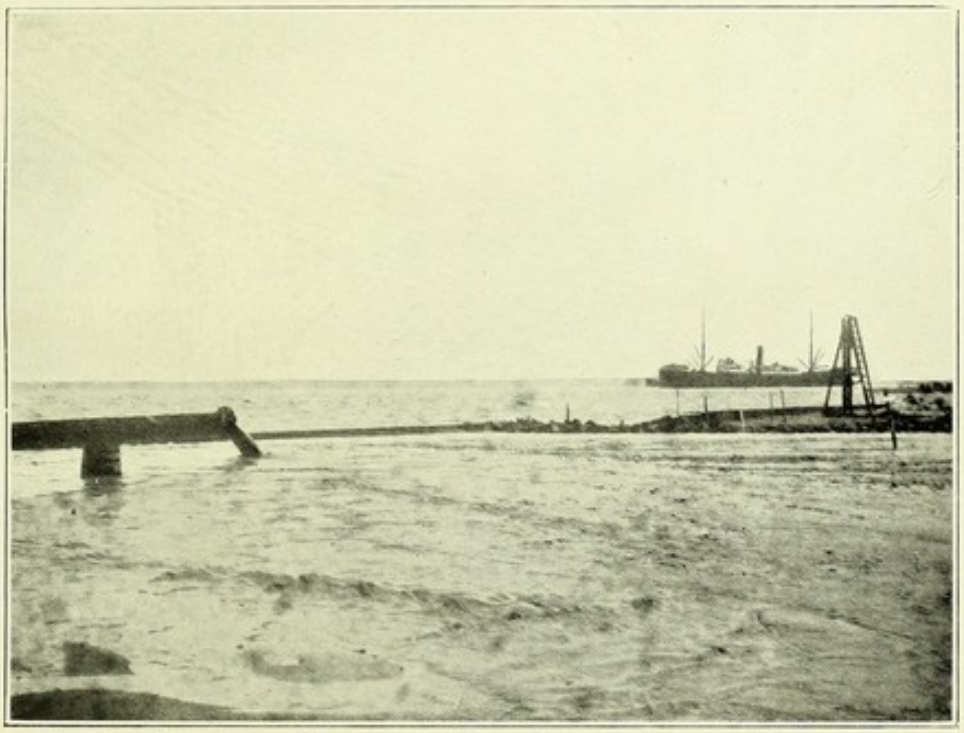

FIG. 5. Forcados. The same as Fig. 4 but seen from a different aspect.

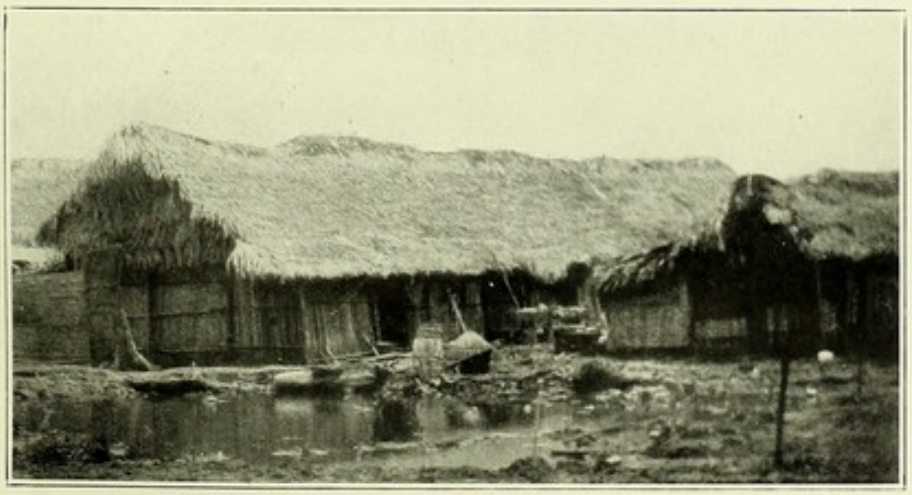

FIG. 6. Forcados. A native hut, built of reeds.

FIG. 7. Forcados. Government artizans' and clerks' quarters, built upon reclaimed swamp, shewing how the occupants exclude ventilation by mats and canvas.

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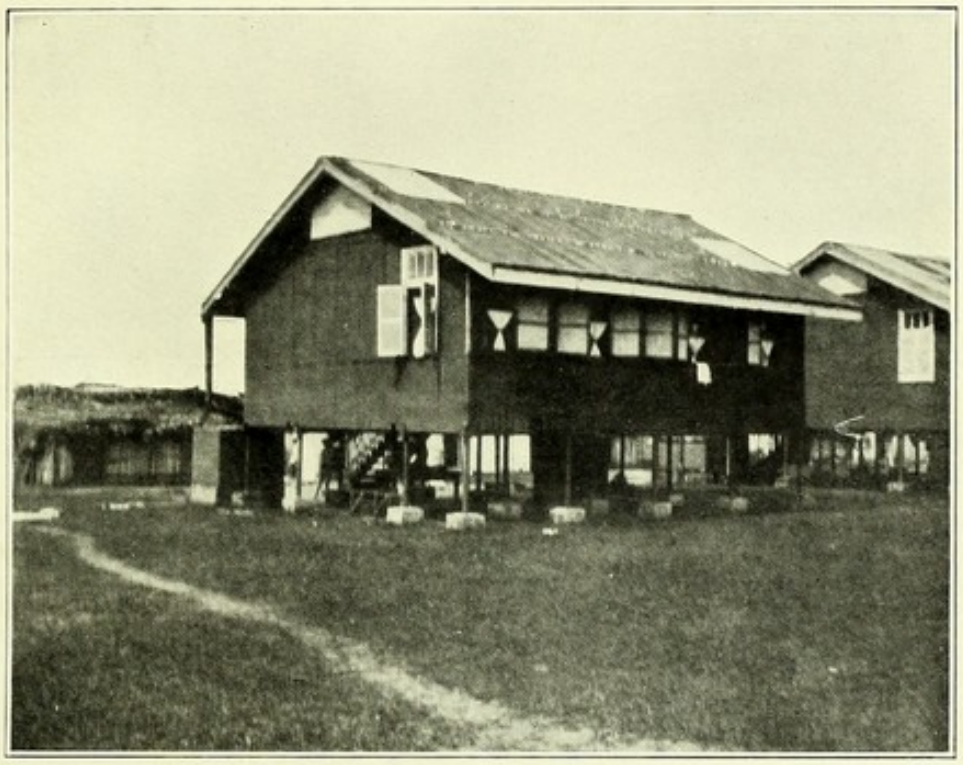

FIG. 8. Forcados. A native official's house, built upon piles, on reclaimed swamp. On the left is seen the kitchen, built of reeds.

FIG. 9. Forcados. Mosquito-proof bungalow for European official.

C. Tinling & Co., Ltd., Imp.

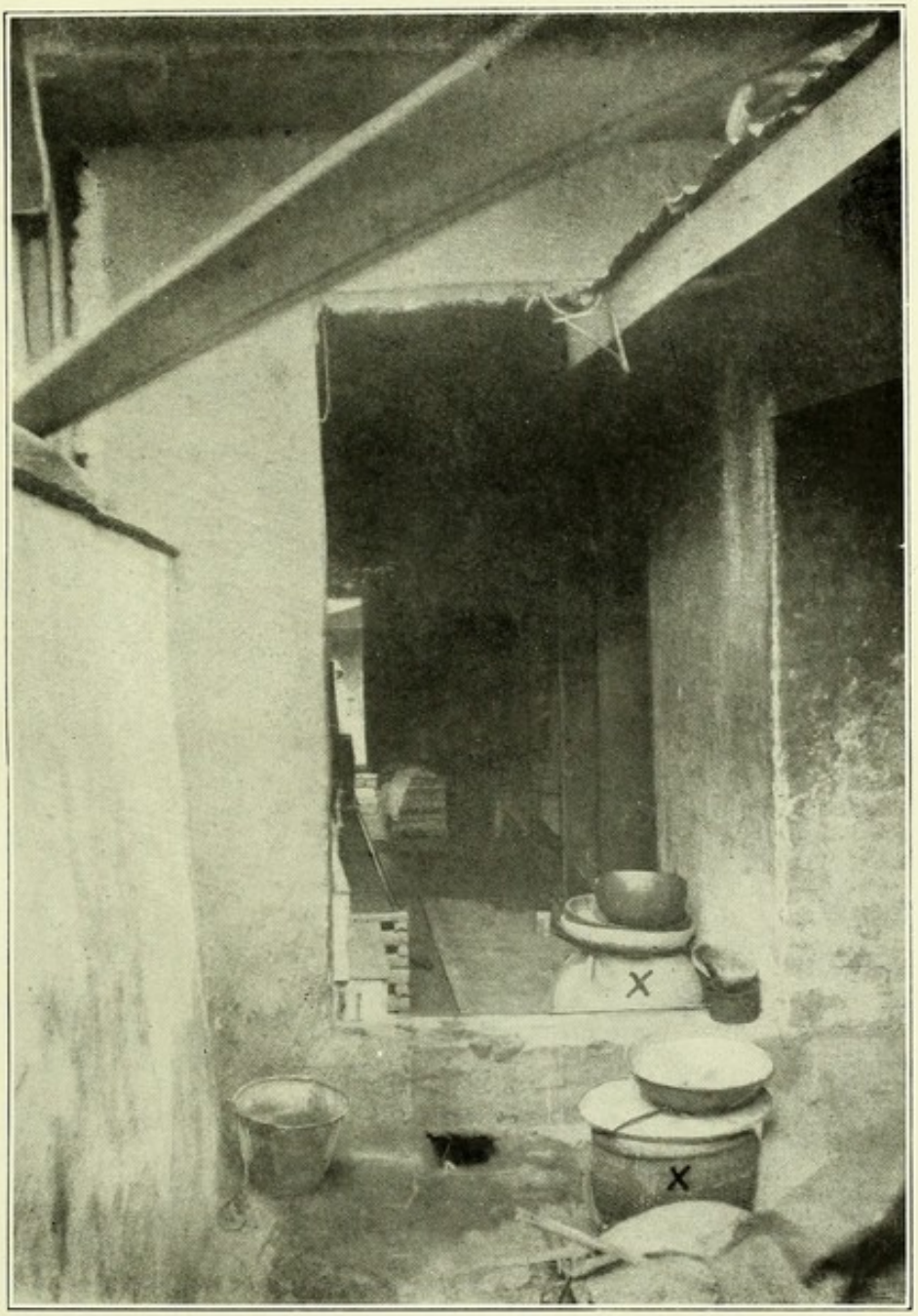

FIG. 10. Earthenware water-pots—a favourite breeding place of domestic mosquitoes.

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FIG. 11. Meko (Report I). Illustrating the manner in which water is carried. Mosquitoes breed freely in the calabashes shewn.

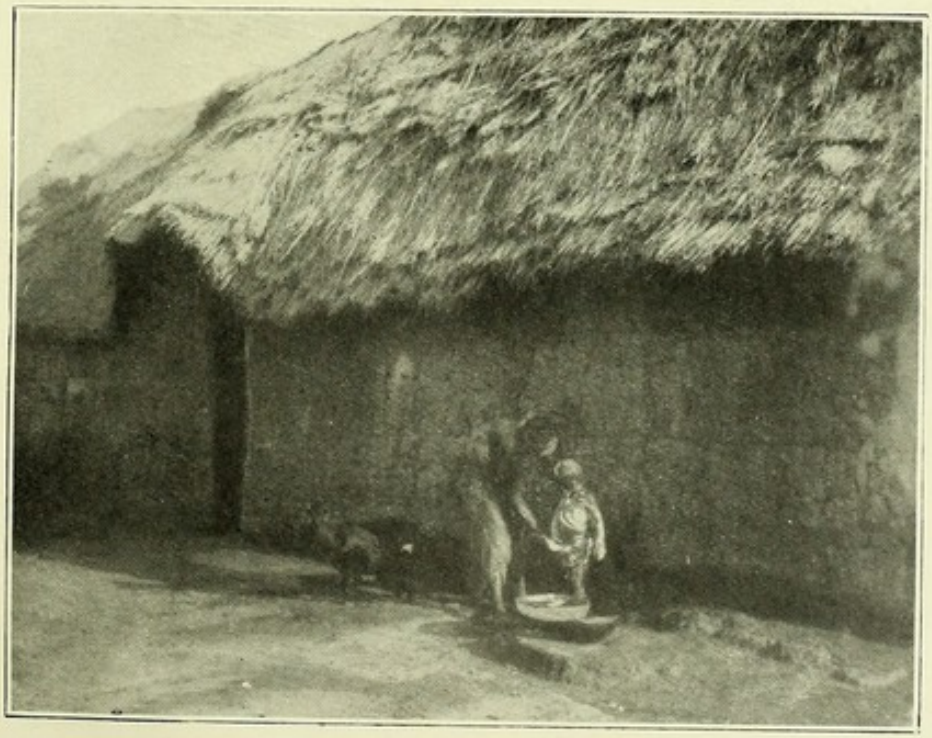

FIG. 12. Meko (Report I). The outer aspect of a native house which forms one side of a quadrilateral compound.

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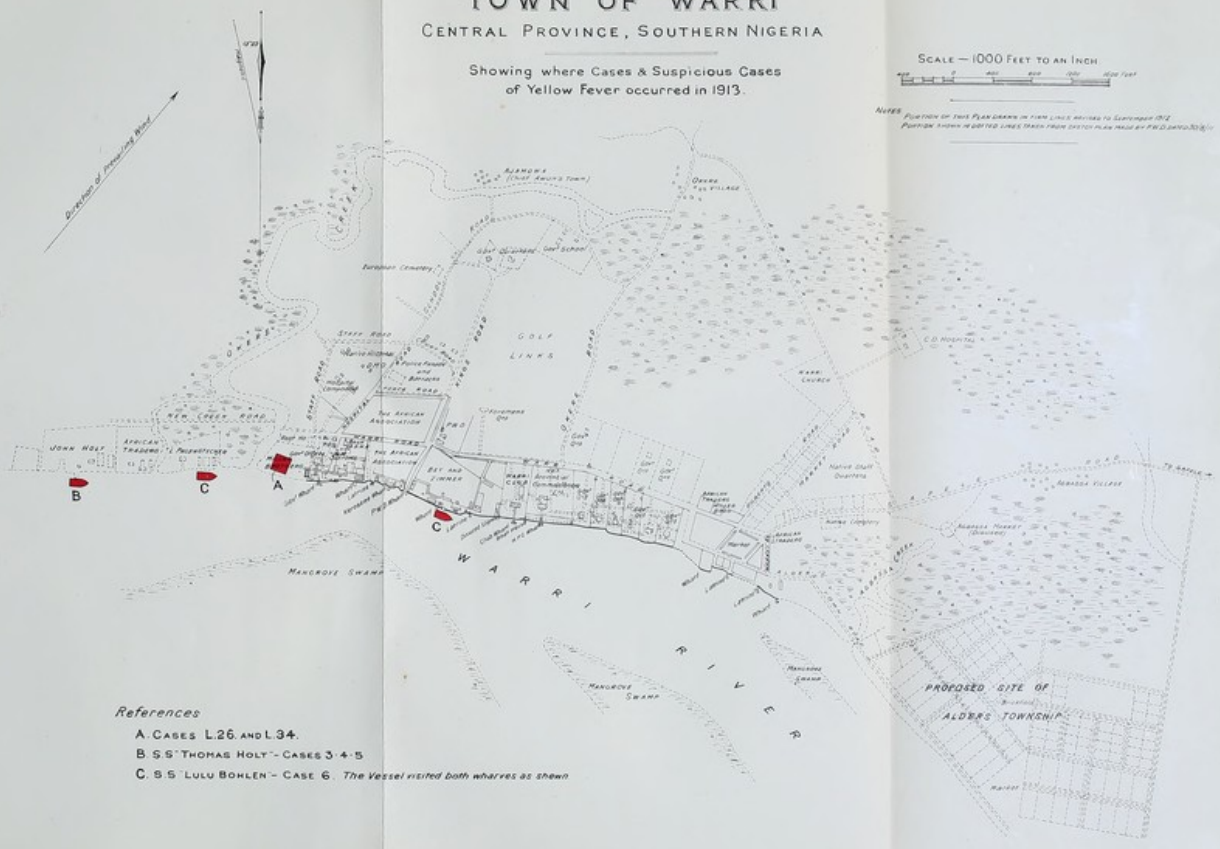
PLAN OF
TOWN OF WARRI
CENTRAL PROVINCE, SOUTHERN NIGERIA

Showing where Cases & Suspicious Cases of Yellow Fever occurred in 1913.

SCALE — 1000 FEET TO AN INCH

NOTES. PORTION OF THIS PLAN DRAWN IN FINE LINES REVISED TO SEPTEMBER 1912.
PORTION SHOWN IN DOTTED LINES TAKEN FROM SKETCH PLAN MADE BY P.W.D. DATED 30/6/11



References

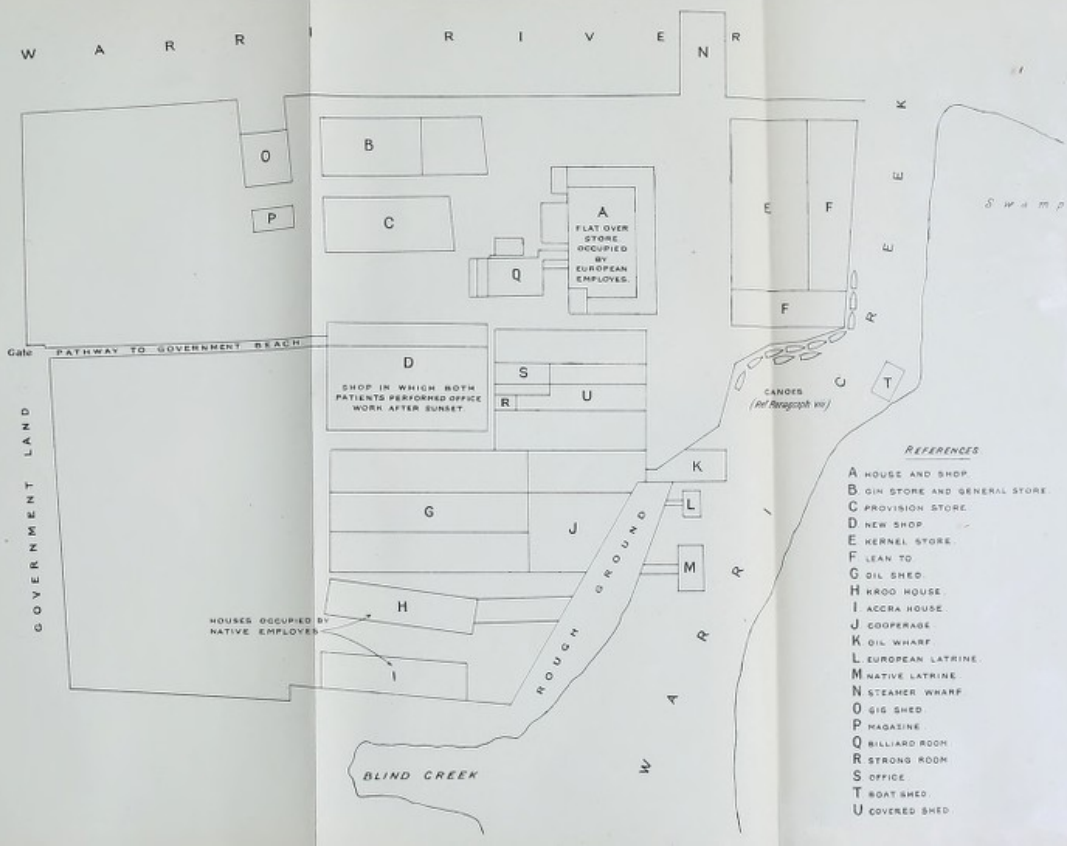
A. CASES L.26. AND L.34.

B. S.S. "THOMAS HOLT" – CASES 3-4-5

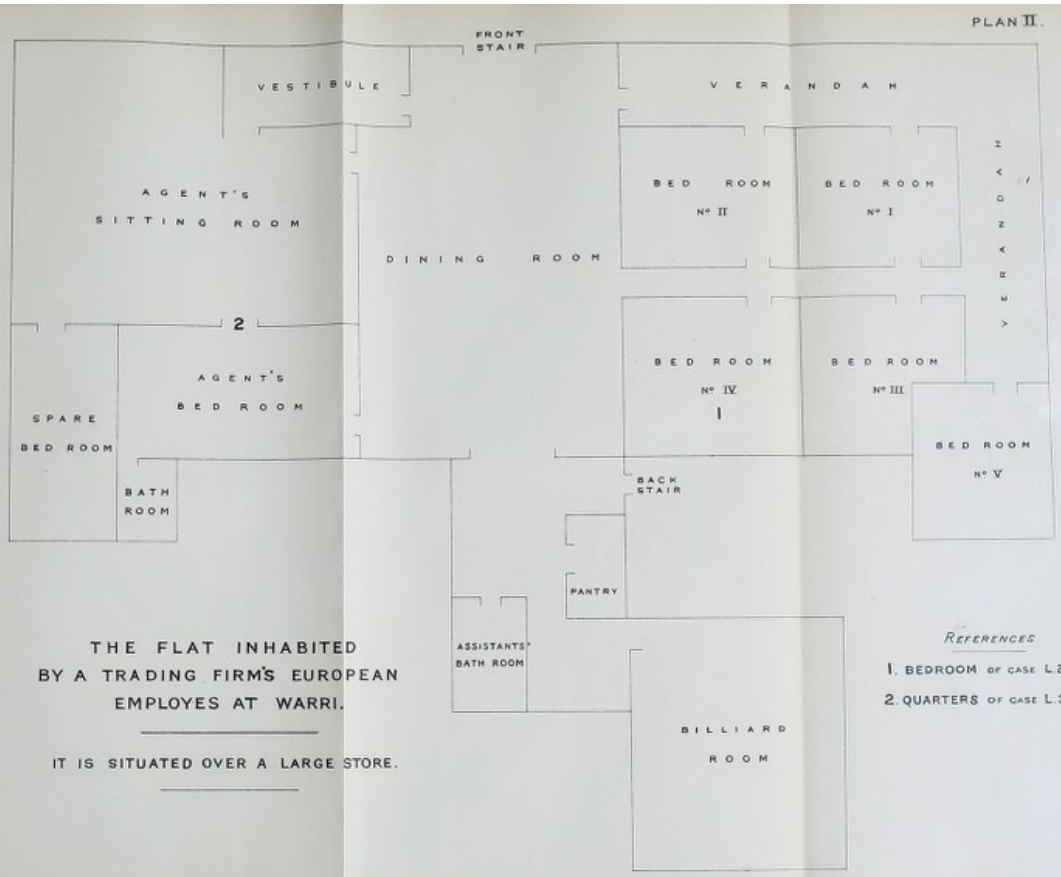
C. S.S. "LULU BOHLEN" – CASE 6. *The Vessel visited both wharves as shewn*

PLAN I.

A TRADING FIRM'S COMPOUND, WARRI.



PLAN II.

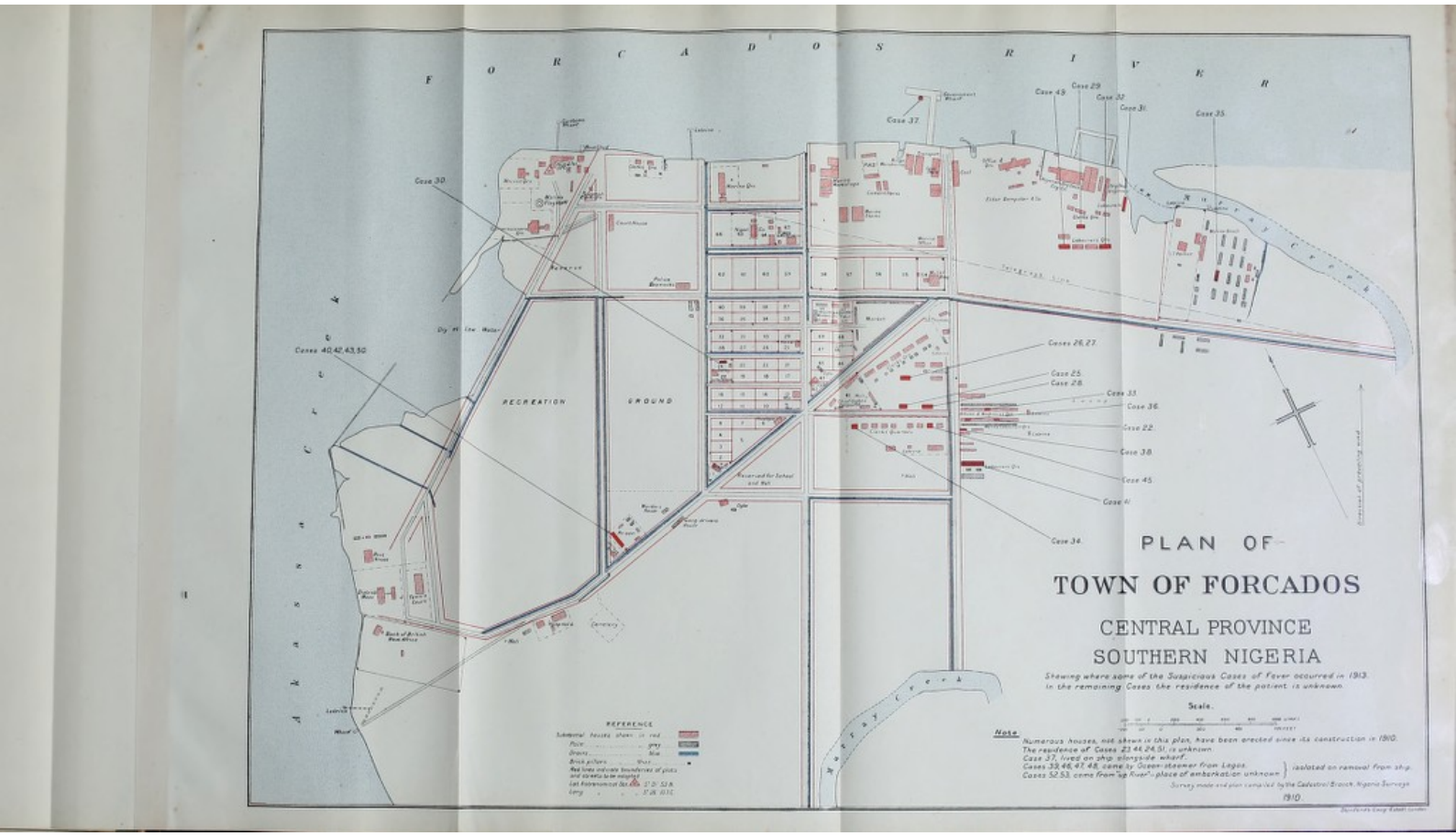


THE FLAT INHABITED BY A TRADING FIRM'S EUROPEAN EMPLOYES AT WARRI.

IT IS SITUATED OVER A LARGE STORE.

References

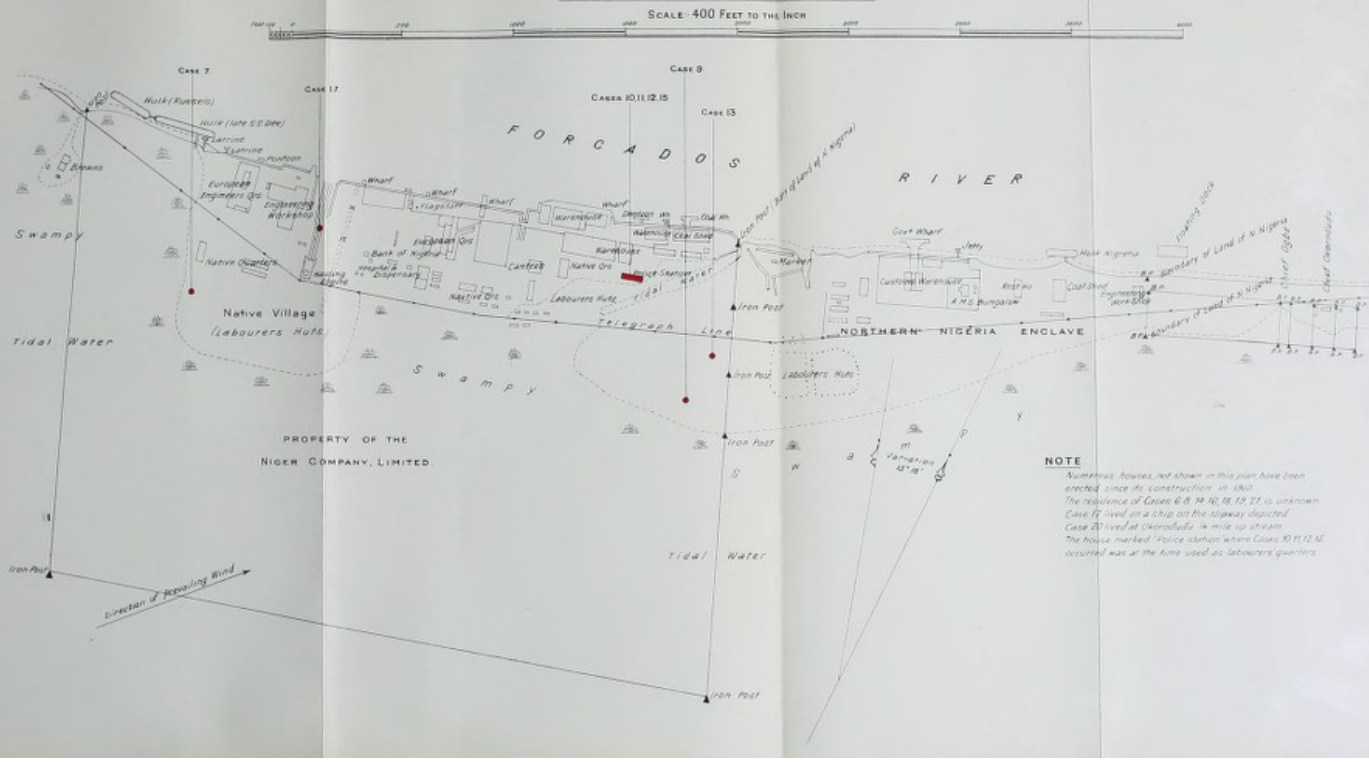
1. BEDROOM OF CASE L.26.
2. QUARTERS OF CASE L.34.


FORCADOS RIVER
Case 37.
Case 48
Case 29
Case 32
Case 31.
Case 35
Case 30
Case 40,42,43,50
Cases 26,27.
Case 25.
Case 28.
Case 33.
Case 36.
Case 22.
Case 38.
Case 45.
Case 41
Case 34.
RECREATION
GROUND
ATLANTIC OCEAN
Murray Creek
PLAN OF
TOWN OF FORCADOS
CENTRAL PROVINCE
SOUTHERN NIGERIA
Showing where some of the Suspicious Cases of Fever occurred in 1913.
In the remaining Cases the residence of the patient is unknown.
Scale.
REFERENCE
Note
Numerous houses, not shown in this plan, have been erected since its construction in 1910.
The residence of Cases 23,44,24,51, is unknown.
Case 37, lived on ship alongside wharf.
Cases 33,46,47,48, came by Ocean-steamer from Lagos.
Cases 52,53, came from Ug River - place of embarkation unknown
} isolated on removal from ship.
Survey made and plan compiled by the Cadastral Branch, Nigeria Surveys
1910.

PLAN OF BURUTU.

Showing where some of the Suspicious Cases of Yellow Fever occurred in 1913. In the remaining Cases the residence of the patient is unknown.

SCALE: 400 FEET TO THE INCH



NOTE

Numerous houses, not shown in this plan, have been erected since its construction in 1901.
The residence of Cases 6.8.14.16.18.19.21 is unknown.
Case 17 lived on a ship on the slipway depicted.
Case 20 lived at Okorodudu ¼ mile up stream.
The house marked 'Police station where Cases 10.11.12.15 occurred was at the time used as labourers quarters.


TERRITOIRE MILITAIRE
NORTHERN PROVINCES
SOUTHERN PROVINCES
CAMEROONS
BIGHT OF BENIN
BIGHT OF BIAFRA
LAKE CHAD
RIVER NIGER
RIVER BENUE
SOKOTO
KANO
KADUNA
ZARIA
ZUNGERU
NAKARGUTA
BAUCHI
BORNU
NASSARAWA
ILORIN
IBADAN
ABEOKUTA
LAGOS
BENIN CITY
OWERRI
CALABAR
OGOJA
YOLA
MAIDUGARI
OUTLINE MAP
OF
NIGERIA
1915
By Major W. H. Beverley, Reserve of Officers.
Scale of Miles
REFERENCE
KANO
ABEOKUTA
KATSINA

10.IV.41