

QUININE PROPHYLAXIS AND THE TREATMENT OF MALARIA IN A COOLIE POPULATION: A CONTRIBUTION FROM ASSAM.

BY CHARLES, E. P. FORSYTH,
M.B., M.R.C.P., (Lond.), D.P.H.

Tezpur.

THE question of the value of quinine prophylaxis against malaria is an important one, and one that demands careful examination.

Of late a good deal of consideration has been given to the matter in India and elsewhere, the concentration of troops in malarious areas in different continents,—Europe, Asia and Africa,—bringing the subject into prominence. The trend of opinion would appear to have become in many respects adverse to the employment of quinine in this way, but the position as a whole still remains very undecided. In itself, however, it is a useful advance that widespread criticism has been directed to the practice, as with continued careful observation some exact knowledge must eventually be obtained of a difficult matter beset with many fallacies.

In these notes no attempt has been made to set forth any peculiarly definite conclusions on the value of prophylaxis as a whole. The matter recorded has reference only to a coolie population working on tea-gardens in Assam, where it has been the custom for many years past to administer quinine to whole labour forces with a view to diminishing the frequency of malarial attacks, and where the procedure has been heavily relied on almost to the exclusion of other preventive measures against the disease. It has been usual to commence quinine administration in May or June or earlier, and continue it to the middle or end of October, a period coinciding more or less with the rainy season, giving a five-grain tablet variously, twice weekly on separate days, three times a week on alternate days, or on consecutive days often ten grains on the first day and five on the second. The aggregate given has been twenty grains on some estates, but the usual and most frequent dose weekly has been ten grains.

The actual distribution of the tablets has been carried out in different ways. As a means of ensuring that every coolie gets his or her dose, some methods have been unsound, but with the best there is often difficulty in making certain that the dose given is really absorbed, as is shown by the number of ejected tablets commonly to be seen near any point of distribution. In 1917, on one garden, quinine days were 63 and the average labour force 1,330, therefore, the amount of quinine used should have been 83,790 tablets. It was actually 46,000, little more than half. On another garden quinine days were 105 in 1917, the average labour force 825 and quinine tablets theoretically 86,625. Actually 45,000 were used. On a third estate quinine days were 64 and the average labour force 766. Tablets used should have been 49,024. The actual number was 26,300. Other

estates would show very similar figures, and this can serve as an illustration of the difficulty of administration, nearly half the people escaping the dose, and this, moreover, taking no account of the wilful waste undoubtedly prevalent. It has to be recognised in this respect that the people dealt with are of the labouring class, of low average intelligence, by no means amenable to discipline, and the difficulties of efficient distribution on a tea-garden are in practice great; but it is often true that these difficulties can largely be overcome if suitable pains are taken by a sufficient and reliable staff.

Taking all the circumstances, however, into consideration, it appeared highly probable that, in spite of the weight of time and authority in its favour, the indiscriminate distribution of quinine to a garden labour force, whether given once, twice or three times a week, was of no value in controlling the disease, but that, on the contrary, it was economically unsound and otherwise most unprofitable in that it went far towards obscuring the importance of more legitimate anti-malarial measures, and in order, therefore, to obtain some definite data on the matter the following observations were made in 1917 on a garden (population 1,817), known to be one of the most malarious in the district. Two sets of coolie lines were taken—A and B—and from March to July no prophylactic quinine was given (non-quinine period), while from August to October arrangements were made to give this with special care (quinine period). As a control, to people in the other lines of the garden no prophylactic quinine was given whatever.

Results were as follows:—

Lines.	Population.	Percentage of malarial cases.		Difference.
		Non-quinine period.	Quinine period.	
A. and B ...	1,151	32.12	28.37	3.75
Other ...	666	19.12	18.86	...

It will be seen that in lines A and B in the quinine period there was a reduction in malarial cases of 3.75 per cent., but to effect this small reduction—equal in actual figures to 213 cases of malaria—162,355 grains of quinine, *i.e.*, 32,471 five-grain tablets of quinine hydrochloride were administered. The figures for the other lines demonstrate that there was no natural increase in malaria to be allowed for, save for climatic reasons, but rather the opposite, during the quinine period (August–October).

Again for November, line A was deprived of its quinine while the administration was continued in line B. Actually 2,195 grains were given in A (population 619) and 23,415 grains in line B (population 532).

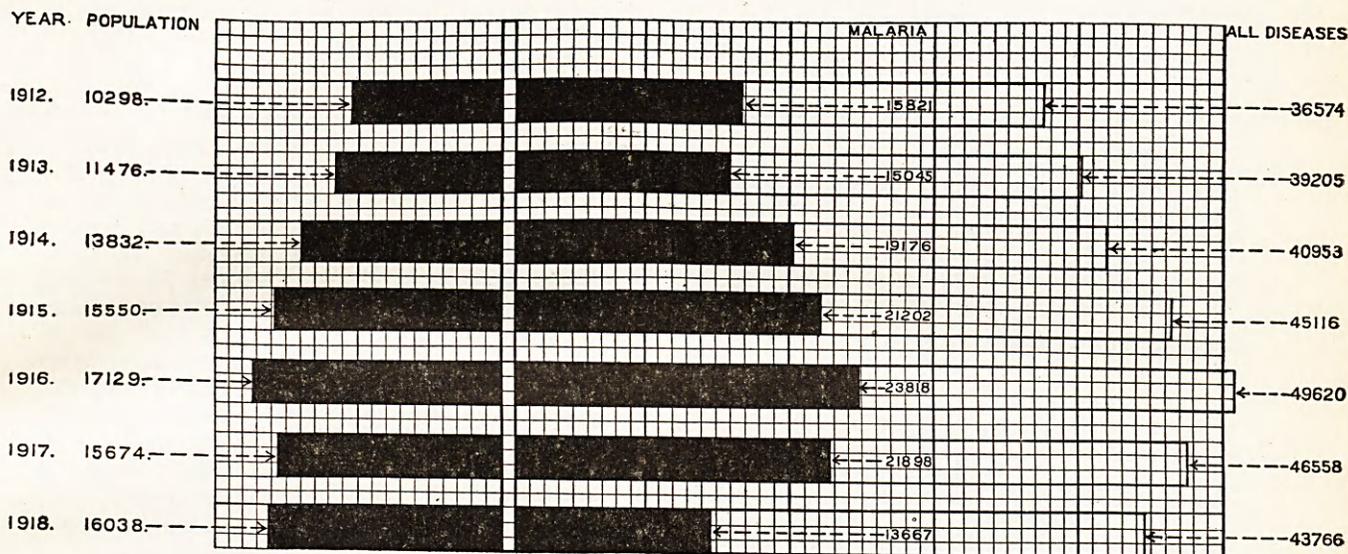
Cases of malaria were 181 in A, and 179 in B, or a percentage of 29.1 in the non-prophylactic area against 33.6 in the other, a rate higher by 4.4 per cent. in spite of the amount of quinine given. These lines were comparable in every respect—in site, class of house, proximity to hospital and type of population. It is true that the period of observation was a short one, but the results as far as they go are clearly not

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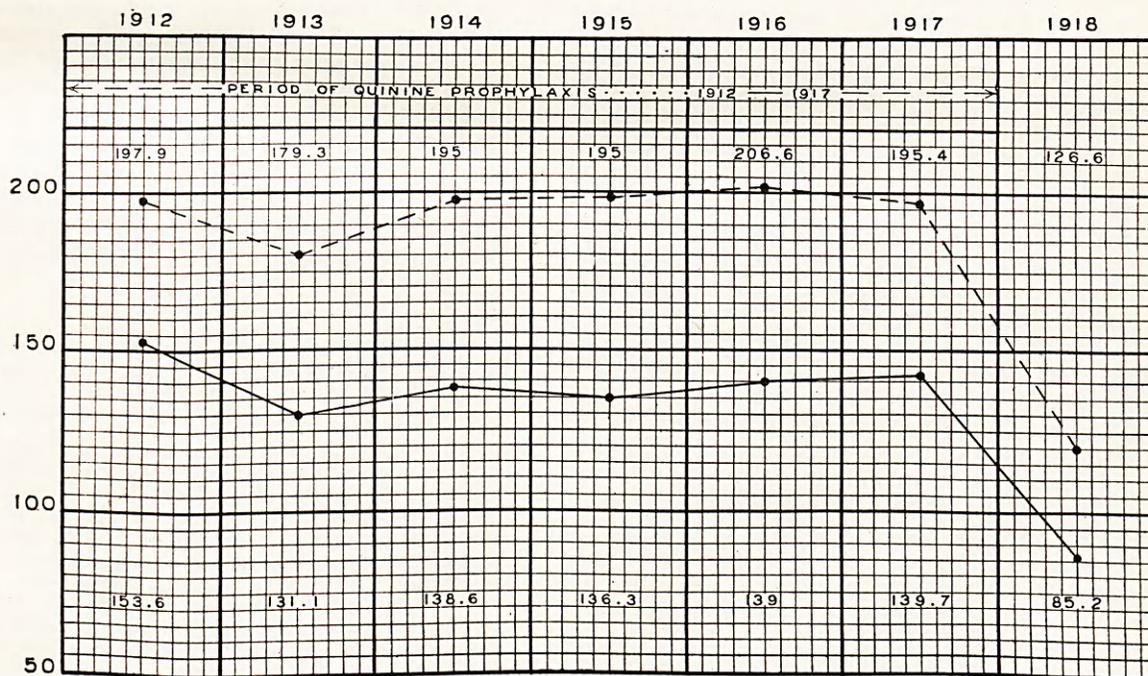
DIAGRAM



In the six years 1912-1917 quinine was used for prophylaxis, in 1918 no prophylactic quinine was given.

In 1918 the number "all diseases" includes 4,431 cases of influenza.

CHART.



Continuous line shows malarial attacks per hundred population.
Dotted line shows malarial attacks per hundred labour force.

favourable to quinine prophylaxis, and the work was looked on as experimental and carried out with all possible care.

amount is to be given to them in two-and-a-half-grain doses.

A special *Monthly Register* of all malarial cases is to be kept as follows :—

MONTH.

1	2	3	4	5	6	7	8	9	10
Serial number.	Reference number.	Name.	Age.	Sex.	Line.	Date of admission.	Temperature.	Spleen.	Dates when quinine given and amount in grains.

These results, along with the fact of no evidence of any improvement having been afforded in the yearly incidence of malaria (as shown in chart) by the system hitherto employed, were taken as sufficient justification for the total abolition of quinine prophylaxis amongst coolies in 1918, to affect, in all, labour forces numbering 16,960. At the same time it was recognised that more could be done with the drug in the actual treatment of cases of malaria as they arose, where quinine could be employed with sure utility. It has been the case that a coolie develops an attack of "fever," and goes to hospital, where the trouble is correctly diagnosed, and he receives a dose of quinine. Next day the fever remits, he feels better and goes to work. He gets fever on the third day when he may get some more quinine, but he finally goes to work inadequately treated and is lost sight of, only to return to hospital ill again in a few days or a week. This goes on till he is ill enough to become an in-patient and obtain his first chance of thorough treatment. The malarial lists have thus been swelled by what really were relapsed cases, the relapse being due to incomplete treatment of the primary attack, and to systematise the treatment and render it efficient the following methods were devised and carried out through 1918, and on through the current year. Rules were issued as follows for the guidance of the doctor resident on each estate :—

MEMORANDUM.

With a view to the more efficient treatment of malarial fever with quinine, the following rules are to be carried out in all cases of the disease ordinarily treated as out-patients :—

On the first day of attendance at hospital, or on the first day when the diagnosis of malaria is established, the patient is to receive twenty grains of quinine in liquid form in five-grain doses. On the following day fifteen grains of quinine in five-grain doses, and on five succeeding days ten grains of quinine, *i.e.*, the total amount of quinine to be given is 85 grains spread over a period of seven days; during the last five days of the treatment the patient may be at work, and the quinine may be given in the form of a five-grain tablet twice daily; treatment with purgatives and diaphoretics is to be carried out as usual and as may be required in each individual case; children aged between 3 and 14 years of age are to be given half the above dose, and infants under 3 years a quarter; women in an advanced state of pregnancy are not to receive more than fifteen grains of quinine in one day, and the daily

NOTE.

"Serial number" is the serial number for the month. "Reference number." If the patient has been under treatment for malaria at any time during the previous two months, or earlier in the same month, the former serial number or numbers to be noted here.

"Temperature." The highest temperature found on the first day of treatment to be recorded in this column.

"Spleen." Spleen to be examined on admission and record to be made as follows :—

- meaning not palpable,
- + meaning palpable or to be felt one finger-breadth below costal margin,
- ++ meaning to be felt two finger-breadths below costal margin.
- +++ meaning to be felt three or more finger-breadths below costal margin.

"Amount of quinine in grains" to be recorded under "dates when given" in RED ink when the patient is on sick leave, and in BLACK when patient is at work.

The register kept in the above form on each estate affords information chiefly as follows :— In *column 2* relapsed cases are recorded and can be suitably dealt with individually, while generally the total of these cases gives evidence regarding the efficiency of the treatment; *column 6*, from which a summary is made at the end of every month, yields the percentage of cases arising in different lines, defining in this way the malarious areas on each estate; from *column 9* is made up monthly, for statistical record, the number of "spleen" cases occurring in the different age-groups, *viz.*, 0-5, 5-10, 10-15, 15-20 years and over, and from it also individual cases of chronic malaria are marked down for special treatment. *Column 8* is used merely as a check on diagnosis, and from the *column of dates*, kept in red and black ink, an estimate can be made at a glance in the course of the month of the severity of the cases generally and the amount of loss of labour. It also gives monthly the total amount of quinine used in treatment.

In formulating the rules endeavour was made to interfere as little as possible with the discretion of the estate doctor directly in charge of the case, the amount of quinine to be given being stated merely as a guide, though it has actually worked out as nearly as possible correct. What is insisted on is the systematic carrying out of the treatment for the full seven days as a minimum.

Below is shown diagrammatically population dealt with, number of malarial cases, and number of sick from all diseases for each of the

seven years. 1912 to 1918, and the chart appended shows yearly for the same period the number of cases of malaria per hundred population and per hundred labour force. It is clear that during the six years 1912 to 1917, no impression was made on the incidence of the disease by the exceedingly costly procedure of using quinine as a prophylactic. The decided fall in 1918 affords evidence of the value of the more thorough quinine treatment adopted, and so far during the current year, under the same system, the improvement appears to have been well maintained.

One must conclude, therefore, that quinine prophylaxis as ordinarily carried out has shown itself entirely useless. It might be of possible value only were the quinine given, say, in four times the amount generally used, *i.e.*, instead of ten grains being given to half the labour force, at least twenty grains should be given to the whole adult population. This could only be done accurately or satisfactorily by a special staff using a system of registration, and this requirement plus the cost of the drug must render the procedure prohibitive, particularly when the doubtful nature of the benefit is kept in view. On the other hand the greatest care should be taken in the thorough quinine treatment of malaria as it arises; special attention should be paid to "spleen" cases both amongst children and adults, and the importance of intelligent expenditure on anti-mosquito work—oiling, draining and jungle-clearing round lines—should be fully recognised.

In fair criticism it might be contended that in order to obtain full and satisfactory results quinine should be used both in efficient treatment and in properly organised prophylaxis, but the expenditure necessary for the latter cannot, I am convinced, be justified by any results likely to be attained. I am strongly of opinion that the money and energy this would demand, could be infinitely more profitably employed against the disease in other directions, for quinine prophylaxis can be at best a poor and illogical means of combating malaria. The true method of attack must be, in our present knowledge, against the active carrier of the disease—the mosquito—and it is impossible to expect any complete results from quinine alone. Anti-mosquito work in Assam undoubtedly presents vast and manifold difficulties, and can apparently only be carried out tentatively and partially. I consider, however, that it should be kept steadfastly in view, and while there is ample recognition of where the real importance of the struggle lies, quinine at the same time should be used to the best proven advantage, *vis.*, in treatment, not overlooking in this respect the care of the child-population,—reservoirs of infection.

In abandoning quinine prophylaxis as described above, the question of financial economy was not primarily entered into. However costly the drug, tea companies would grudge no expenditure likely to result in increase of health amongst their labour forces, and the cost of

quinine, heavy as it has been especially in the past few years, has been looked on as a necessary expense. Waste, however, is an entirely different matter. The economy in quinine that can be effected in a large tea district is very great, and when this is concurrent with a decrease in the incidence of malaria, the total gain is of moment. There has been no question of limiting the use of quinine with a view to the reduction of expenditure. The question solely lies in the employment of the drug to the best advantage, and the abandonment of prophylaxis has been carried out on my own initiative as medical officer in charge of the estates.

These notes scarcely convey an argument against quinine prophylaxis *per se*, and I fully allow that experience points to the decided value of quinine as a prophylactic against malaria in Europeans, who take the drug with strict regularity, and what I believe is of real consequence, infection amongst them is not of such an intensive character as must prevail amongst a coolie population. In this connection it is of great significance to observe that blackwater fever is unknown in individuals habituated to the use of quinine as a prophylactic against malaria, and this fact in itself affords a powerful reason for the careful retention of the practice as a rule of life, at least in all districts where this serious disease is endemic.

CINCHONIDINE IN MALARIA.

By D. S. OLLENBACH,

MAJOR, I.M.D. (Retd.).

Medical Officer, E. B. Ry., Sealdah.

RECENTLY Col. Sir L. Rogers suggested* using injections of cinchonine bishydrochloride for the treatment of malaria which he had introduced with satisfactory results in his practice.

The following 24 cases (*vide* table below) were injected deep in the deltoid with the usual precautions at the Eastern Bengal Railway Dispensary, Sealdah.

The first dose for adults was 7 minims and subsequent ones 10 or about 3 and 5 grains respectively. From 2 to 4 injections were given on successive days where possible or about 8 to 18 grains. One case had 6 injections or 28 grains in 16 days at intervals. Two children had one injection each of 1½ to 2 grains and would have no more, but they were backed up with quinine orally, and, strange to say, made the best recovery. The treatment was extended from 2nd November to 30th December, 1918.

All the cases were genuine ague, going through the usual cold, hot and sweating stages and coming on every second day with the regularity of a clock, though no blood examination was made. Some had temperatures up to 106 degrees F., others had returned from service overseas, and the rest were local cases, while three came from a mining district.

* *British Medical Journal*, Nov. 1918.