PREVENTION OF MALARIA AT HYDERABAD, SIND.

By Major H. Herrick.

Royal Army Medical Corps.

The following account of antimalarial measures undertaken during the year 1911, at Hyderabad, Sind, may be of interest to the casual reader of the Journal, and probably will be of special interest to officers who have been stationed there in former years.

The Cantonment of Hyderabad, Sind, is situated on a plateau about 30 ft. above the level of the surrounding country and 134 ft. above sea level, in lat. 25° N., and long. 63° E. and about two miles from the Indus.

The plateau is composed chiefly of gravel and sand, with patches of clay; the surrounding country is mostly alluvial, flat, and cultivated where the soil is favourable. The low-lying country was flooded in former years by the annual rise of the Indus, which filled the irrigation canals and caused them to overflow their banks. This is most important from the point of view of antimalarial measures.

Climate.—There is a cold and a hot season. The former, lasting from November to February, has an average shade temperature ranging from 75° to 45°. The hot season, from March to October, is very trying; the temperature during the hottest months ranges from 110° F. to 115° F. and occasionally reaches a maximum of 120° F. in the shade.

The prevailing winds are from the south or south-west in the wet season, and from the north or north-east in the cold season.

Rainfall.—The annual rainfall is very slight, usually only a few inches.

City.—The native city and saddar bazaar are to the north and north-east of the cantonments, and about half a mile distant.

Water Supply.—The drinking water is taken from the Indus at Gidu Bandar, which is on the left bank of the river opposite Kotri. The supply comes to Hyderabad in a masonry aqueduct and is supplied to the cantonments from water-towers.

The water for irrigation purposes is supplied from canals which take off from the Fuleli Canal, the Fuleli taking off from the Indus.
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a few miles above Kotri. The Fulci Canal is marked "A" on the map.

The New Wadhu Wah is the main canal at the west of cantonments; the old Wadhu Wah takes off from it, as shown on the map, and irrigates all the north of cantonments.

The Parkar Wah Canal takes off from the Wadhu Wah at the
sluice marked "E" on the map, and is the main irrigation canal to
the west of cantonments. This canal, when allowed to overflow,
filled up tanks marked "G" and "I" on the map.

Another canal, which is outside cantonment limits, took off from
the New Wadhu Wah at boundary pillar No. 21 and flowed
parallel to the road to boundary pillar No. 20, where there was a
sluice marked "R" on the map, which was supposed to regulate
the flow of water into the watercourse leading to tanks "P" and
"L."

The ground to west of the above mentioned watercourse was
irrigated by lifting the water by means of Persian wheels. Tanks
"G" and "I" could also communicate with tanks "L" and "P."

The annual rise of the Indus is due to the melting of the snow at
its source, and at the sources of its tributaries, and by the end of
June, or beginning of July, the Indus, at Kotri, is in full flood, and
the canals are rapidly filling, and by August in former years the
west and south parts of the cantonment were one vast jheel,
which, when partially dried, made an excellent breeding-place for
mosquitoes. This was the state of affairs when I arrived at
Hyderabad in September, 1909, for temporary duty, and also in
November, 1910, when I was permanently transferred to the
station. All the tanks were full, and most of the ground under
water, and everywhere mosquitoes were breeding.

Nothing much could be done in 1910 as the canals had over-
flowed; so I had to turn my attention to what could be done next
year to get rid of the water already in the tanks, to fill up these
tanks, and to prevent more water getting in.

When I first suggested cutting off the water through the Parkar
Wah Canal there was an outcry that the cantonment would lose
revenue from stoppage of cultivation, and from the diminished sale
of lac from the babul trees in the plantation to the west of the
cantonment.

The first difficulty was got over by repairing sluice "E" and
making the cantonment superintendent responsible for the supply
to the cultivators, so that only a sufficient amount of water should
be let in, and no more. By these means water was never left
standing more than twenty-four hours in the irrigation channels.

As to the babul trees—a forest officer was consulted and gave
as his opinion that once every two years was sufficient for water the
plantations. So both these obstacles were surmounted.

The Parkar Wah was banded at X, this stopped the water
going into tank "I." A bund was also put at the upper end of
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tank "L" where it adjoins the road. The next step was to get rid of the water from tanks "L" and "P," and try to prevent them filling again. These tanks were the main breeding-grounds for anopheles mosquitoes, and were in close proximity to a highly infected native population.

The soldiers from barracks used to spend a great portion of their evenings fishing in these tanks, and I am certain that many men became infected while so occupied.

![Tank "P," after completion of work. The water went beyond the trees. All the light portions of picture were formerly under water.](http://example.com/tank_p_after_completion_of_work)

The Hyderabad Gymkhana Club and the Royal Field Artillery officers' mess were always full of mosquitoes in the evening, and bungalow No. 6 on the map went by the name of "Fever Hall." Bungalow No. 5, "the dak bungalow," was full of anopheles mosquitoes, and my wife and I got infected there shortly after our arrival at the station.

I was sitting one evening by the bank of tank "L" telling my troubles and propositions to a civil engineer, when the thought struck us, why not grade the banks of these tanks so that the flow instead of being from the south, as shown by arrow on the map,
should be from the north-west? Acting on this idea I ordered the sluice at “R” to be closed and kept closed, so that no water could get in, and then the filling of tank “P” was commenced, using jail labour.

We had many checks. First by being flooded by water from the municipal aqueduct, and again by the sluice at “R” being opened, by whom I could never find out. The sluice “R” was

![Image of Tank L looking south, before grading and draining.](image)

again closed, and a bund put there as well to absolutely put a stop to any more “regrettable incidents.” The grading and filling of tank “P” was now continued, and in about twenty-seven days it was reduced to a narrow channel about 6 ft. wide with a fall to the south. I regret I did not take a photograph of this tank before commencing work, but give one of the tank after the filling was completed. In this photograph the channel is well shown.

Tank “L” was next attacked. In addition to jail labour we
were permitted by Lieutenant-General H. C. Slater, C.B., commanding 4th Quetta Division (who always gave us valuable assistance in all antimalarial and other sanitary measures), to employ the men of the detachment 1st York and Lancaster Regiment and of the 10th Jats, the European troops working two days a week in the mornings, and the Indian troops working four days a week in the evenings. They all worked with a will, so much so that, after eighty-one days’ labour, tank “L,” the Beyla tank of Hyderabad, was dry, and one of the show spots for a general

![Tank L, after grading and filling, looking south.](image)

inspection was gone for ever. I give photographs showing this tank both before and after filling. The first shows the tank used as a swimming bath, and the second shows the tank dry. As matters now stand all the tanks that are shown on the map as “holding water always,” and consequently breeding mosquitoes, are dry. If water gets into tank “L” from an exceptionally high Indus, all that will have to be done will be to open the sluice at “M” and the water will flow south, and can be lifted by Persian wheels, which were previously used for irrigation, and the place will be left dry in less than a week. Various estimates were put in by experts for the
work of filling the tank or for getting rid of the water otherwise. I heard sums from 1½ to 2½ lakhs of rupees mentioned. That the water should be drained back to the Indus, by means of locks, was another wild suggestion.

The Hyderabad Cantonment Committee were able to do the work for 1,500 rupees.

Hyderabad, Sind, had never been considered a health resort, but its evil reputation was almost entirely due to the incidence of malaria. The following table will give an estimate of the sickness generally.

<table>
<thead>
<tr>
<th>Year</th>
<th>Average annual strength</th>
<th>Average constantly sick—all causes</th>
<th>Ratio per 1,000, average strength, all causes</th>
<th>Average constantly sick—malaria</th>
<th>Admissions—all causes</th>
<th>Admissions for malaria</th>
<th>Malarial ratio per 1,000 average annual strength</th>
<th>Average constantly sick—malaria</th>
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<tbody>
<tr>
<td>1901</td>
<td>390</td>
<td>1,228</td>
<td>26·34</td>
<td>6·28</td>
<td>26·34</td>
<td>183</td>
<td>469·2</td>
<td>6·28</td>
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<tr>
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<td>1,311</td>
<td>27·5</td>
<td>3·71</td>
<td>458·1</td>
<td>164</td>
<td>358·1</td>
<td>3·71</td>
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<tr>
<td>1903</td>
<td>483</td>
<td>1,089</td>
<td>29·92</td>
<td>6·13</td>
<td>483·1</td>
<td>214</td>
<td>443·1</td>
<td>6·13</td>
</tr>
<tr>
<td>1904</td>
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<td>790</td>
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<td>4·73</td>
<td>494</td>
<td>114</td>
<td>229·3</td>
<td>4·73</td>
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<tr>
<td>1905</td>
<td>494</td>
<td>959</td>
<td>23·24</td>
<td>2·38</td>
<td>491</td>
<td>69</td>
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<tr>
<td>1906</td>
<td>411</td>
<td>1,338</td>
<td>20·79</td>
<td>5·21</td>
<td>488</td>
<td>274</td>
<td>609·7</td>
<td>5·21</td>
</tr>
<tr>
<td>1907</td>
<td>492</td>
<td>1,049</td>
<td>19·16</td>
<td>8·04</td>
<td>488</td>
<td>300</td>
<td>612·7</td>
<td>8·04</td>
</tr>
<tr>
<td>1908</td>
<td>443</td>
<td>1,201</td>
<td>18·75</td>
<td>7·60</td>
<td>433</td>
<td>299</td>
<td>309·5</td>
<td>7·60</td>
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<tr>
<td>1909</td>
<td>523</td>
<td>928</td>
<td>14·11</td>
<td>5·11</td>
<td>523</td>
<td>177</td>
<td>315·4</td>
<td>5·11</td>
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<tr>
<td>1910</td>
<td>556</td>
<td>799</td>
<td>15·41</td>
<td>7·03</td>
<td>556</td>
<td>165</td>
<td>804</td>
<td>7·03</td>
</tr>
</tbody>
</table>

Remarks.—1905 was the first year in which men were treated in barracks.

In 1910 there was an apparent increase in the average constantly sick from malaria; this was due to keeping men suffering from benign tertian in hospital for ten days after the temperature became normal, and malignant tertian cases till all parasites had disappeared from the peripheral blood.

The rainfall at Hyderabad does not appear to have any influence on the incidence of malaria, but the rise of the River Indus distinctly has, especially in some years, as can be seen from the attached chart. A high river means bursting of bunds and much flooding. This was most marked in the years 1901, 1903, 1906, 1907, and 1908.

Probably the large number of admissions for malaria in 1906
was due to two units arriving from very malarious stations, the 32nd Battery R.F.A. from Deesa, and a detachment 1st South Wales Borderers from Mian Meer, and also to an exceptionally high flood in the Indus, which inundated the surrounding country and left many breeding-places for mosquitoes.

When the fundamental work of getting rid of mosquito breeding-places in cantonments was completed, we turned our attention to getting rid of adult mosquitoes in the houses, and began on the old huts in the Indian infantry lines, which were about to be demolished prior to the erection of new barracks. These huts were of mud, with kutcha roofs, smoke blackened inside—an ideal hiding-place for mosquitoes. Sulphur was used to fumigate them, 2 lb. being burnt for each 1,000 cubic feet of space. This must have killed all the mosquitoes, as, previous to fumigation, larvae were constantly found in puddles left by workmen in the lines, but after fumigation larvae were never found. The débris from the old huts was used to fill in hollows and level the ground in the vicinity of barracks. Levels were taken, and the work done in a scientific manner. The new barracks, Indian infantry lines, were then fumigated, and lastly the British troops barracks.
These British barracks, seven (7) in number, are very large rooms, each having a capacity of 100,000 cubic feet, and three large ventilators in the roof, besides many doors and clerestory windows. The ventilators in the roof were covered with tents, the doors and the clerestory windows closed and made as air-tight as possible by pasting brown paper over the chinks. The same amount of sulphur was used—i.e., 2 lb. per 1,000 cubic feet, and three hours allowed for fumigation. Everything living in the rooms was killed, including insects, birds and reptiles.

Prophylactic Issue of Quinine.—As many adverse opinions have been expressed as to the value of quinine as a prophylactic, I determined to give it a fair trial, but, owing to the stringent orders in the 4th Division about the issue of quinine to all men, I was unable to leave any men as a "control," hence the value of the trial is largely negatived.

Fifteen grains of quinine were given on two consecutive days to all European troops, commencing early in July. The quinine was given in solution with dilute nitro-hydrochloric acid, which is a valuable liver stimulant. After about a month I stopped the nitro-hydrochloric acid and gave dilute hydrochloric acid, which does not upset the digestion (as the other dilute mineral acids do), and hastens absorption.

The quinine was given between breakfast and dinner, usually about 11 a.m., and always under the close supervision of an officer, Royal Army Medical Corps. I mentioned my method of giving the prophylactic quinine to the P.M.O. 4th Quetta Division, Colonel W. G. Macpherson, when he made his inspection at Hyderabad on August 10, 1911, and he evidently found this method of administration with hydrochloric acid useful as he issued a circular letter on the subject, dated Quetta, September 22, 1911, saying "that when salts of quinine are given prophylactically... they must be dissolved by hydrochloric acid in very dilute solutions."

To be of any use, quinine (given as a prophylactic) must be commenced some months before an epidemic is expected, given in sufficient doses, and under careful supervision, care being taken that no man escapes.

The followers, syces, &c., were also given quinine as a prophylactic by a sub-assistant surgeon attached to one of the Royal Field Artillery units.

Quinine was also given to all officers' servants and their families in cantonments; the drug was taken round and administered by men of the cantonment mosquito brigade, under an Indian N.C.O.
To malarial patients in hospital quinine was given in 10-gr. doses, if possible two hours before an anticipated attack in benign tertian cases, and then after the temperature became normal in 5-gr. doses, three times a day, for ten days.

In malignant tertian cases 10-gr. doses were given two or three times a day according to the severity of the attack. The after-treatment of malarial cases was carried on for four months. Each man on admission with malaria was given a malaria case-sheet, a copy of which is attached; and on this sheet was entered the total amount of quinine given. When a man was transferred the malaria case-sheet went with him to ensure continued treatment. Ten grains of quinine daily was the dose given in the after-treatment of an attack, and, if a relapse occurred, the fact was noted on the sheet in red ink, and the patient began anew his four months' curative course. A register by units was also kept in hospital, in which was noted the daily attendance of the men undergoing continued treatment.

Acid hydrochloride of quinine was the salt always given in hospital and quinine sulphate to those attending hospital.

A good deal of the above plan of treatment may be well known to officers who have served in the 4th Quetta Division, but I give it for the benefit of those who have not been so fortunately situated. All cases undergoing treatment in barracks were segregated as far as possible, but as the Government has not yet seen fit to provide men with mosquito nets, the isolation of men, except in those units which provided nets out of regimental funds, was merely nominal.

A step forward has at last been made, as, by an Indian Army Order just published, I see that units can purchase nets for Rs. 3:2 from the Army Clothing Department. The size of the net is 6 ft. 6 in. by 3 ft. 6 in. by 4 ft. I only hope that the net will be made without an opening in the side.

One corps only at Hyderabad, namely, the detachment 1st York and Lancaster Regiment, provided the men with nets, but as they had not got these nets in September and October, 1910, they were heavily infected. The Artillery Brigade arrived from South Africa after the season of greatest prevalence of mosquitoes, and was not so severely infected.

Nets are provided in hospital for all men suffering from malaria, and the malaria ward is also screened by gauze doors, and all windows are covered with wire gauze; in the hot season when punkahs are in use the nets can be removed. I have recommended that if the malaria at Hyderabad continues, the barrack rooms
be screened, but I think the cost will be prohibitive. Failing this I recommended that a portion of the verandah of each barrack room should be made mosquito proof with wire gauze, to segregate all men undergoing their four months' treatment.

The average monthly incidence of malaria for the last nine years, as well as for 1911, is shown in the following table:—

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last 9 yrs</td>
<td>17.1</td>
<td>4.0</td>
<td>8.11</td>
<td>11.44</td>
<td>12.0</td>
<td>10.44</td>
<td>9.77</td>
<td>9.88</td>
<td>11.66</td>
<td>18.88</td>
<td>43.0</td>
<td>37.77</td>
</tr>
<tr>
<td>1911</td>
<td>12</td>
<td>8</td>
<td>6</td>
<td>11</td>
<td>17</td>
<td>11</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

This table shows that, in previous years, the last three months of the year accounted for the greater number of the annual admissions for malaria, that is just after the breeding season of the anophelines, with probable fatigue and cold as an exciting cause. An alternative theory to the above, which I give for what it is worth, is that when the wind changes to the north or north-east, which it does in November or December, the infected mosquitoes get blown into the lines from the city and sudder bazaar. Again a slight rise in the number of malarial attacks is seen on the commencement of the hot weather, which may be due to the awakening of infected hibernating mosquitoes, or the onset of the warm weather may be the encouraging factor.

Relapses.—Relapses, I take it, are due to a decrease in the germicidal power of the blood, or to a diminution in antitoxic power to a toxin which is produced by the malarial parasite. Relapses always occurred in the weakest men who never played games, and did little else than loaf around barracks.

I examined 108 malaria case-sheets, and found a record of relapses in 33, or 30.55 per cent.; every slight rise of temperature was taken as a relapse, even when a man was only detained for an afternoon, and a blood examination was always made. In only nine cases out of 108, or 8.33 per cent., was the blood of a patient with a relapse found to contain parasites—out of those nine cases in which parasites were found, eight were malignant tertian, one was benign tertian.

The average time of apyrexia in malignant tertian cases which relapsed under treatment was twenty-eight days, though in one case the apyrexia was as short as fourteen days, and in another as long as three and a-half months. In the benign tertian case which relapsed, and in which parasites were found, twelve days was the time of apyrexia.

Of the 33 relapses, 14 were malignant tertian; 19 were benign tertian.
The average time under treatment before relapse was: malignant tertian cases, 45.85 days; benign tertian cases, 36.42 days.

Cases with more than one relapse: malignant tertian, 3; benign tertian, 4.

Number of smears examined for parasites from January 1, 1911, to December 31, 1911, was: malignant tertian, 27; benign tertian, 35; negative, 22; not differentiated, nil.

Recognizing the importance of ascertaining the degree of infection of the European troops, it was decided to examine the blood of all men in the station. Five minutes was allowed for each slide, and opposite each man's name in the list was put the result, thus: five minutes ± (James). Twenty slides were examined in a day—more could not be undertaken, as routine work could not be neglected, and the climate was not conducive to prolonged microscopical investigation.

**Months of Greatest Incidence of Mosquitoes.**—The months of greatest incidence of mosquitoes were, in my experience, from September to November, though other officers have noted March and April.

The anopheles mosquitoes found were: *Myzomyia culicifacies, M. Rossi, Ch. pulcherrima, Pyrethophorus jeyporiensis.*

Captain J. Anderson, I.M.S., found *Ch. pulcherrima* breeding in the Beyla tank—tank "L" on the map.

Captain F. C. Fraser, I.M.S., wrote to me as follows: "The Beyla tank 'L' and a tank the other side of the city always harboured larvæ of *Ch. pulcherrima.* Jacob's tank to the north of cantonments was sterile (chiefly because it grew no weed like the two former tanks). I always noticed that when the water rose in the Beyla and submerged the weed, the larvæ grew scanty, or disappeared; as soon as the water sank to the level of the weed, the larvæ began to teem. In several bungalows in Cantonments, and once in the Jail gardens, in small pools due to pipe-water waste, or watering, larvæ of *P. jeyporiensis* were found. These were the only two kinds I ever detected, and they were never found together; one kept to the tanks, and the other to the pools, and both are mosquitoes with an evil reputation for carrying malaria, especially *Ch. pulcherrima.* Colonel Adams, R.A.M.C., sent me a mosquito caught in his house which proved to be *P. jeyporiensis,* and I have taken both kinds in the club wash-house."

I lived in Colonel Adams' bungalow, mentioned above, while at Hyderabad, and I hardly ever saw a mosquito in it, though it is
only 200 yards from a small native village, which must swarm
with mosquitoes. I know the children living in this village have
a high spleen index, though I regret I was never able to make a
reliable census. Of all the European troops I examined, I only
found enlarged spleens in 5.12 per cent.

The Club is within 100 yards of the Beyla tank "L," which
was the chief breeding-place in cantonments, as mentioned before.
A small tank marked "NN" on the map gave no trouble, as it
was not deep, being merely a depression where rain water, and
water from the swimming bath, used to collect. It was graded and
filled in the same manner as tank "L." Many complaints were
made to me that I was spoiling the only green and picturesque
spot in Hyderabad, and also killing all the grass on the cricket
ground; all this may be true, but I, for one, prefer an arid waste
to malaria. As far as watering the cricket ground goes, water
can be found about 20 ft. below the surface, and it should be
quite easy to sink a shallow well and pump up sufficient water
for irrigation by means of a windmill.

The breeding-places of mosquitoes in officers' compounds gave
a certain amount of trouble until I abolished all catch-pits and
had the bath waste run into gardens with quick-growing plants,
such as canna and guinea grass, in them. Funds did not admit
of a mosquito brigade being kept up for the officers' lines as well
as for the Sudder Bazaar, so I arranged that the sanitary orderly
of each unit should visit the officers' bungalows of his own corps,
and report to me if any insanitary condition was found. I found
this plan to work well.

And now to compare the admissions for malaria for 1911 with
that of the previous year:

Malaria Cases by Months.

1910. | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
-----|-----|-----|-----|-------|-----|------|------|-----|------|-----|-----|-----|
     | 20  | 13  | 2   | 10    | 11  | 3    | 6    | 6   | 3    | 14  | 38  | 40  |

Ratio per 1,000 Average Monthly Strength.

1910. | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
-----|-----|-----|-----|-------|-----|------|------|-----|------|-----|-----|-----|
     | 32.62| 20.16| 3.35| 17.33 | 18.90| 5.10 | 10.60| 10.86| 10.38 | 60.60 | 73.78 | 69.56 |

Malaria Cases by Months.

1911. | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
-----|-----|-----|-----|-------|-----|------|------|-----|------|-----|-----|-----|
     | 12  | 8   | 6   | 11    | 17  | 11   | 2    | 2   | 4    | 5   | 3   | 3   |

Ratio per 1,000 Average Monthly Strength.

1911. | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec |
-----|-----|-----|-----|-------|-----|------|------|-----|------|-----|-----|-----|
     | 20.54| 13.55| 10.61| 20.07 | 30.96| 19.89| 3.77 | 3.81 | 7.39 | 8.71 | 5.35 | 5.23 |

Malaria Cases by Months.

1912. | Jan | Feb |
-----|-----|-----|
     | 3   | 4   |
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<table>
<thead>
<tr>
<th>Ratio per 1,000 Average Monthly Strength.</th>
<th>Jan.</th>
<th>Feb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers. 1910</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strength ... ... ... ... 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria cases ... ... ... ... 6</td>
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<td></td>
</tr>
<tr>
<td>Ratio per 1,000 ... ... ... ... 461.53</td>
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<td></td>
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<tr>
<td>Officers. 1911</td>
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<td></td>
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<tr>
<td>Strength ... ... ... ... 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malaria cases ... ... ... ... 2*</td>
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<td></td>
</tr>
<tr>
<td>Ratio per 1,000 ... ... ... ... 133.33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* One officer admitted twice.

| Women. 1910 |      |      |
| Strength ... ... ... ... 33              |      |      |
| Malaria cases ... ... ... ... 6           |      |      |
| Ratio per 1,000 ... ... ... ... 181.86   |      |      |

| Women. 1911 |      |      |
| Strength ... ... ... ... 29              |      |      |
| Malaria ... ... ... ... Nil              |      |      |

| Children. 1910 |      |      |
| Strength ... ... ... ... 47              |      |      |
| Malaria cases ... ... ... ... 6           |      |      |
| Ratio per 1,000 ... ... ... ... 127.65   |      |      |

| Children. 1911 |      |      |
| Strength ... ... ... ... 62              |      |      |
| Malaria ... ... ... ... Nil              |      |      |

Pyrexia of Uncertain Origin.
1910           1911
2              2

Sand-fly Fever.
1910           1911
20             Nil

One officer remarked to me that my figures were valueless because of their paucity. My reply to all who are of a like mind is, that I do not aspire to be a compiler of statistics, I merely state facts and figures as they occurred at Hyderabad. I regret that opportunity did not offer of ascertaining to what extent the mosquito population was infected.

Much still remains to be done, namely, to find out the percentage of mosquitoes with zygotes in their stomachs and sporozoites in their salivary glands, also the seasonal variation in infectivity.

One of the Royal Army Medical Corps officers, now stationed at Hyderabad, is being trained at Amritsar in special malaria work, and he will be able to afford valuable assistance in further antimalaria work at this station.

I cannot conclude without thanking the following officers and warrant officers for valuable assistance, without which I would have been unable to carry out the work that was done in Hyderabad in 1911: Captain G. W. Mortimer, 10th Jats, the Cantonment Magistrate; Captain J. A. S. Phillips, I.M.S., the Cantonment Medical Officer; Lieutenant W. B. Rennie, R.A.M.C., in charge.
of malaria wards; Lieutenant K. G. S. MacQueen, and Assistant Surgeon J. S. Menezes, I.S.M.D., who compiled the greater part of the statistics for me, and kept the various records.

MALARIA CASE-SHEET.

INSTRUCTIONS.

A malaria case-sheet will be kept for each man who has an attack of malaria during the year.

A separate roll of these men will be kept for each regiment and battery.

All cases should be admitted to hospital.

After discharge from hospital each case should be treated with quinine for at least four months.

Especial care should be taken in the case of men suffering from malignant tertian infection, to ensure that they do not return to barracks while crescents are to be found in the finger blood.

No man should be struck off the roll until four months have elapsed since the last manifestation of the disease, during which time he has been under continuous quinine treatment.

NAME  NO.  AGE  SERVICE  IN INDIA
REGIMENT OR BATTERY  COMPANY OR SQUADRON

(1) Particulars of first attack in 191–, e.g., clinical and microscopical features, treatment, &c.

ADMITTED  DISCHARGED

(2) Whether fresh infection or recurrence of old infection?

(a) If fresh infection, give dates showing where probably acquired,
(b) If old infection, give particulars of previous attacks, e.g., dates, variety of parasite found, &c.

TREATMENT.

(Any recurrences that may occur during this course of convalescent treatment will be entered as they occur, in red ink, giving full details.)

<table>
<thead>
<tr>
<th>Date</th>
<th>Treatment and remarks</th>
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H. Herrick