

## CHAPTER III

### RESULTS

The results of serum folate level in 104 Thai blood donors are shown in Table 1 and frequency distribution of

Table 1

Serum folate levels in Thai blood donors

No.	Sex	Age	Hb. (g%)	Serum folate level(ng/ml)	No.	Sex	Age	Hb. (g%)	Serum folate level(ng/ml)
1	M	27	13	3.75	26	F	34	12	16.0
2	M	33	13	10.0	27	M	34	13	12.7
3	M	37	13	5.75	28	M	36	13	18.2
4	M	31	13	5.5	29	M	21	13	13.7
5	M	18	13	7.0	30	M	22	13	11.5
6	M	20	13	7.0	31	M	22	13	18.0
7	M	26	13	5.5	32	F	19	-	17.2
8	M	24	13	6.5	33	F	28	13	10.7
9	M	27	13	9.6	34	M	29	13	19.0
10	M	21	13	11.0	35	M	25	13	12.75
11	M	22	13	10.0	36	M	26	13	6.85
12	M	24	13	14.0	37	M	24	13	16.5
13	M	33	13	11.0	38	M	39	13	10.5
14	M	22	13	15.2	39	M	24	13	9.75
15	M	-	-	8.0	40	M	27	13	7.13
16	F	-	-	12.0	41	M	37	13	10.25
17	F	31	12	12.0	42	M	32	13	4.5
18	F	27	12	8.2	43	M	26	13	19.25
19	M	29	13	13.2	44	M	30	13	5.6
20	M	24	13	10.2	45	M	39	13	9.5
21	F	19	-	12.0	46	M	31	13	8.0
22	M	31	13	9.5	47	M	35	13	8.1
23	M	19	13	7.5	48	M	37	13	10.0
24	M	25	13	3.5	49	M	20	13	21.0
25	M	32	13	15.5	50	M	34	13	5.5

Table 1 (continue)

No.	Sex	Age	Hb. (g%)	Serum folate level(ng/ml)	No.	Sex	Age	Hb. (g%)	Serum folate level(ng/ml)
51	M	24	13	3.37	81	M	37	13	6.73
52	M	19	13	15.0	82	M	25	13	6.9
53	M	27	13	7.5	83	M	26	13	14.7
54	M	-	-	6.5	84	M	23	13	5.4
55	M	34	13	6.5	85	M	24	13	13.7
56	M	25	13	6.5	86	M	23	13	5.3
57	M	24	13	6.2	87	M	22	13	3.9
58	M	25	13	8.7	88	M	19	13	6.5
59	M	21	13	8.3	89	F	40	12	4.73
60	M	22	13	6.3	90	M	33	13	14.0
61	M	44	13	7.4	91	M	22	13	7.57
62	M	25	13	4.5	92	M	28	13	9.0
63	F	29	12	7.5	93	M	22	13	5.5
64	F	38	12	4.2	94	M	22	13	8.25
65	M	36	13	10.25	95	M	22	13	7.85
66	M	21	13	6.95	96	M	25	13	7.8
67	M	36	13	8.0	97	M	25	13	8.6
68	M	26	13	8.0	98	M	32	13	8.2
69	M	26	13	9.75	99	M	30	13	7.3
70	M	35	13	11.25	100	M	32	13	12.37
71	M	27	13	4.65	101	M	21	13	10.75
72	M	27	13	5.3	102	M	35	13	9.2
73	M	22	13	7.8	103	M	40	13	15.5
74	M	25	13	12.0	104	M	23	13	6.7
75	M	23	13	5.8					
76	M	28	13	4.13					
77	M	21	13	4.5					
78	M	32	13	3.0					
79	M	18	13	18.5					
80	M	18	13	9.0					

these values is illustrated in Fig. 1. The mean values  $\pm$  one S.D. and the ranges of serum folate levels in 94 male and 10 female subjects are shown in Table 2. There was no

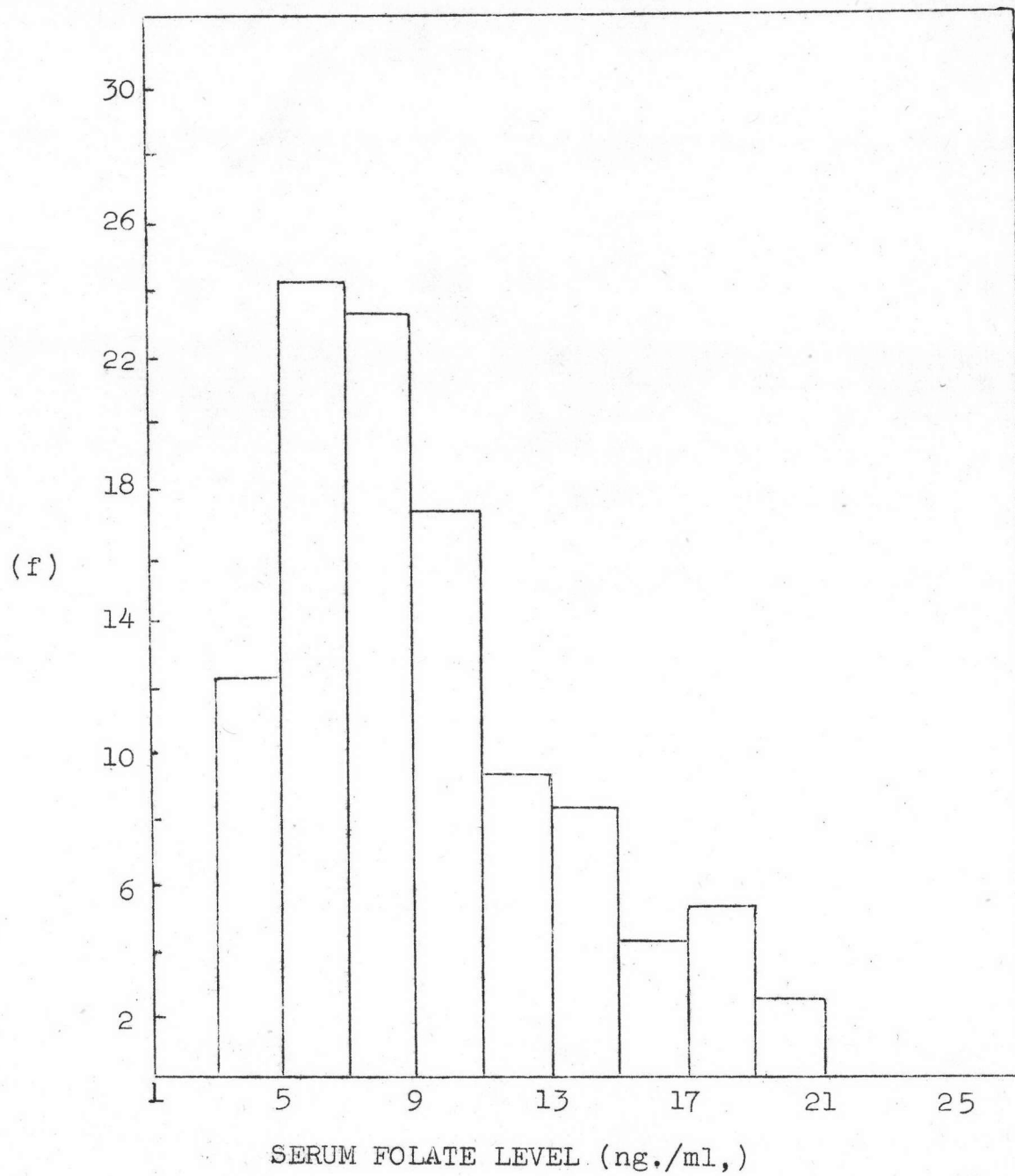


FIG. 1 Frequency Distribution of Serum Folate Level in 104 Thai Blood Donors.

Table 2

Serum folate level in Thai blood donors compared  
with the normal levels

	No. of Subjects examined	Serum folate level (ng./ml.)		t-test
		Range	Mean $\pm$ S.D.	
Male	94	3.0 - 21.0	9.20 $\pm$ 4.04	P > 0.05
Female	10	4.2 - 17.2	10.45 $\pm$ 4.33	
Total	104	3.0 - 21.0	9.32 $\pm$ 4.06	-

significant difference in the mean values of the male and female subjects in the present study. The mean value of serum folate of 104 Thai blood donors (9.32 ng./ml.) was in the same order of magnitude as those results of the normal subjects reported previously (see Table 3).

Table 3

Serum folate concentrations in the normal subjects and in  
Thai blood donors

No.	No. of cases studied	Serum folate levels (ng./ml.)		References
		Range	Mean	
1	100	2.6 - 10.5	5.5	Toennies <u>et al.</u> , 1956
2	38	4.0 - 45.6	15.9 $\pm$ 9.50	Cooperman <u>et al.</u> , 1960

Table 3 (continue)

No.	No. of cases studied	Serum folate levels (ng./ml.)		References
		Range	Mean	
3	100	5.9 - 21.0	9.9	Water and Mollin, 1961
4	N.i	3.7 - 9.3	5.4	Hansen & Weinfeld, 1962
5	43	3.2 - 15.0	8.3	Grossowicz <u>et al.</u> , 1962
6	100	2.7 - 18.5	5.9 ± 2.91	Davis and Kelly, 1962
7	94	2.1 - 28.0	7.8	Spray, 1964
8	-	4.9 - 18.5	9.5	Kershaw & Girdwood, 1964
9	33	4.0 - 18.0	8.1 ± 3.10	Cooper & Lawenstein, 1964
10	45	2.5 - 7.4	4.6 ± 1.36	Reizenstein, 1965
11	22	6.7 - 14.6	9.2 ± 2.00	Grzesiukowicz <u>et al.</u> , 1965
12	7	8.0 - 29.0	16.0	Santini <u>et al.</u> , 1966
13	58	3.4 - 11.6	6.6 ± 1.90	Giles, 1966
14	40	2.1 - 9.5	5.1	Temperley & Horner, 1966
15	N.i	7.0 - 20.0	13.1	Vanier and Tyas, 1966
16	25	3.0 - 11.5	7.4 ± 2.50	Spector and Hutter, 1966
17	100	3.0 - 11.0	5.7 ± 1.92	Magnus, 1967
18	104	3.0 - 21.0	9.32 ± 4.06	Present study.

N.i = not indicated.

Folic acid absorption was also studied in 12 normal subjects. The individual value is shown in Table 4. A mean

Table 4

Folic acid absorption in 12 normal subjects

No.	Sex	Age	Hb. (g%)	Absorption (%)	No.	Sex	Age	Hb. (g%)	Absorption (%)
1	M	25	15.8	37.80	7	M	17	9.4	51.40
2	M	17	13.0	48.10	8	M	20	12.0	51.30
3	M	20	12.0	60.10	9	M	22	-	49.00
4	M	15	9.0	50.00	10	M	25	10.3	61.20
5	M	-	12.0	43.30	11	M	21	15.0	44.80
6	M	23	14.9	45.00	12	M	-	11.8	57.60

value of 49.96 % with a standard deviation of 7.0 % was found in these subjects. The results in comparison with those of the other authors are shown in Table 5.

Table 5

Folic acid absorption in normal subjects in comparison with the results of the other authors.

Oral $^3\text{H}$ -folic acid		Technique of tissue saturation		Folic acid absorp <sup>n</sup> . (%)		References
$\mu\text{g.}$	$\mu\text{Ci.}$	Parenteral dose (mg. folic acid)	Interval before oral dose (min.)	Mean	Range	
200	20	15	30	41.0	27.9 - 64.5	Anderson et al. (1960).
40*	20	15	30	42.0	30.9 - 43.9	" ——— "

Table 5 (continue)

Oral $^3\text{H}$ -folic acid		Technique of tissue saturation		Folic acid absorp <sup>n</sup> . (%)		References
$\mu\text{g.}$	$\mu\text{Ci.}$	Parenteral dose (mg.folic acid)	Interval before oral dose (min.)	Mean	Range	
40*	20	15per day x3	-	40.7	26.0 - 57.8	Klipstein(1963)
15*	12†	30	30	48.2	18.8 - 80.9	Kinner <u>et al.</u> , (1963).
15*	20	30	30	33.1	13.6 - 59.0	Halsted <u>et al.</u> , (1967).
200	20	15per day x4	0	49.96	37.8 - 61.2	Present study.

\* = Dosage per kilogram body weight.

† = The authors expressed the dose as 12  $\mu\text{Ci}$  per mg. The oral dose 15  $\mu\text{g.}$  per kg. for a 70 kg. man is approximately 1 mg.

The serum folate levels in 36 patients with P. falciparum malaria are shown in Table 6. A mean value  $\pm$  one S.D. was

Table 6

Serum folate level in patients with P. falciparum malaria

No.	Sex	Hb. (g%)	Serum folate level(ng/ml)	No.	Sex	Hb. (g%)	Serum folate level(ng/ml)
1	M	-	7.5	2	M	12.6	9.25

Table 6 (continue)

No.	Sex	Hb. (g%)	Serum folate level(ng/ml)	No.	Sex	Hb. (g%)	Serum folate level(ng/ml)
3	M	9.6	4.87	20	M	16.3	8.87
4	M	13.3	8.37	21	M	12.6	1.95
5	M	12.2	2.75	22	M	10.8	1.47
6	M	9.8	2.5	23	F	11.2	10.62
7	M	12.2	1.5	24	M	13.7	2.67
8	M	13.7	6.5	25	M	15.0	7.5
9	M	8.4	8.2	26	M	6.5	14.5
10	M	9.3	5.5	27	F	5.6	2.6
11	F	8.0	9.2	28	M	10.3	1.0
12	M	10.8	1.75	29	M	15.8	2.97
13	M	12.6	2.8	30	F	9.8	8.5
14	M	13.3	3.8	31	M	11.2	7.2
15	F	6.3	1.7	32	M	14.1	10.2
16	M	13.7	5.4	33	F	9.6	1.55
17	M	8.0	2.0	34	M	-	5.5
18	M	13.0	8.25	35	M	-	6.9
19	F	-	6.0	36	M	5.0	7.4

found to be  $5.53 \pm 3.33$  ng./ml. (range 1.0 -14.5 ng./ml.).

There was a significant difference between the values of the normal subjects and these patients ( $P < 0.05$ ).

Folic acid absorption was studied in 8 patients with P. falciparum malaria and the results are shown in Table 7





Table 7

Folic acid absorption in 8 patients with  
P. falciparum malaria infection

No.	Sex	Age	Hb. (g%)	Absorption (%)	No.	Sex	Age	Hb. (%)	Absorption (%)
1	M	26	9.3	38.40	5	M	30	11.8	33.30
2	M	36	12.6	31.70	6	M	16	7.2	18.36
3	M	30	11.8	56.80	7	M	21	12.2	43.44
4	M	29	10.8	49.40	8	M	-	-	59.90

There was no significant difference between these values in normal subjects (49.96 %) and in these patients (41.41 %,  $P > 0.05$ ). The individual value of the serum folate level and the absorption are illustrated in Fig. 2.

The serum folate levels and folic acid absorption in 5 and 13 patients with hookworm infection are shown in Table 8 and 9 and Fig. 3. The mean values of the serum folate levels

Table 8

Serum folate level in 5 patients with hookworm infection

No.	Sex	Serum folate level (ng./ml.)
1	M	2.65
2	M	5.2
3	M	9.25
4	M	9.0
5	M	6.4

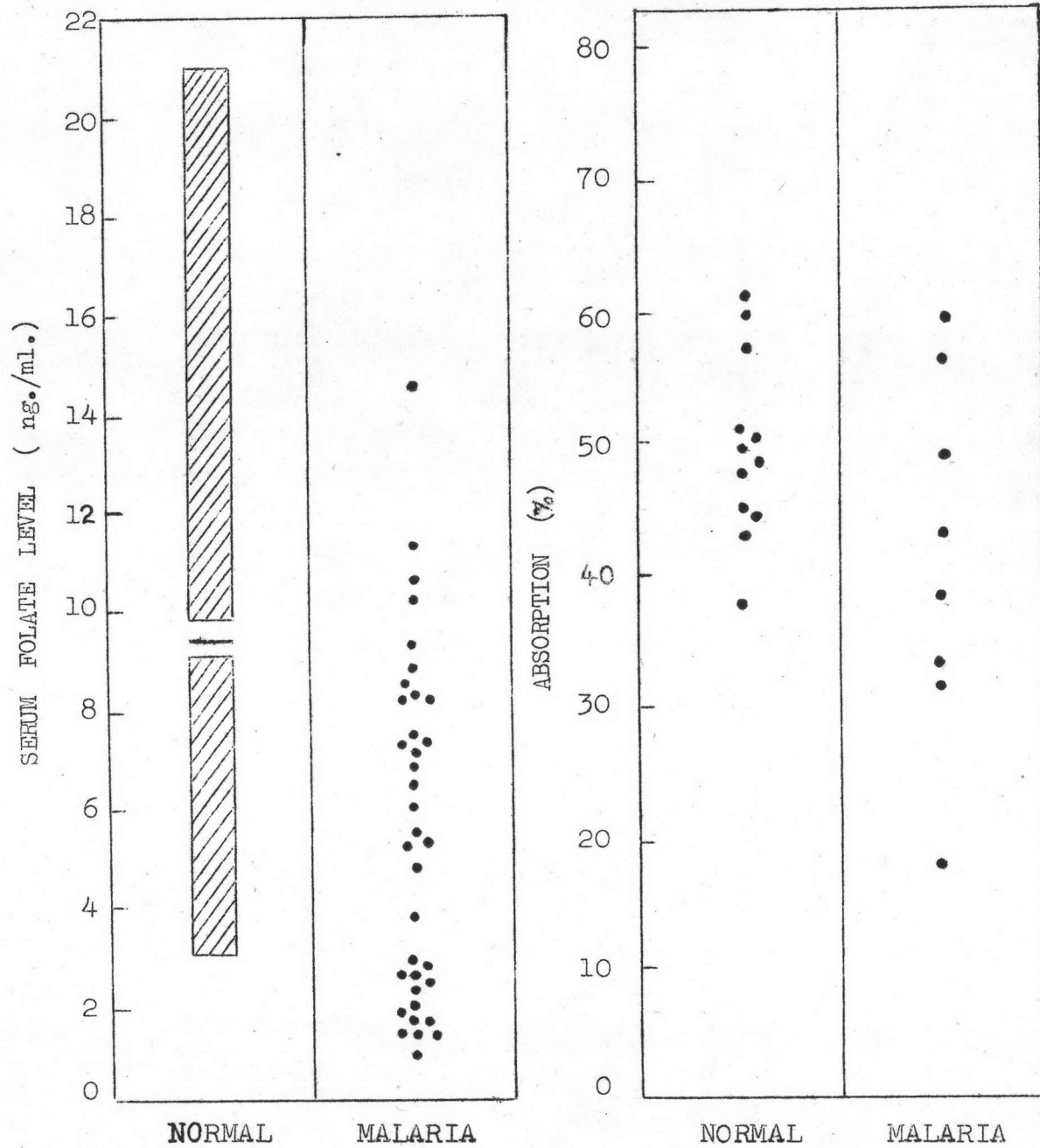


FIG. 2 Serum Folate Levels and Folic Acid Absorption in Patients with P. falciparum Malaria.

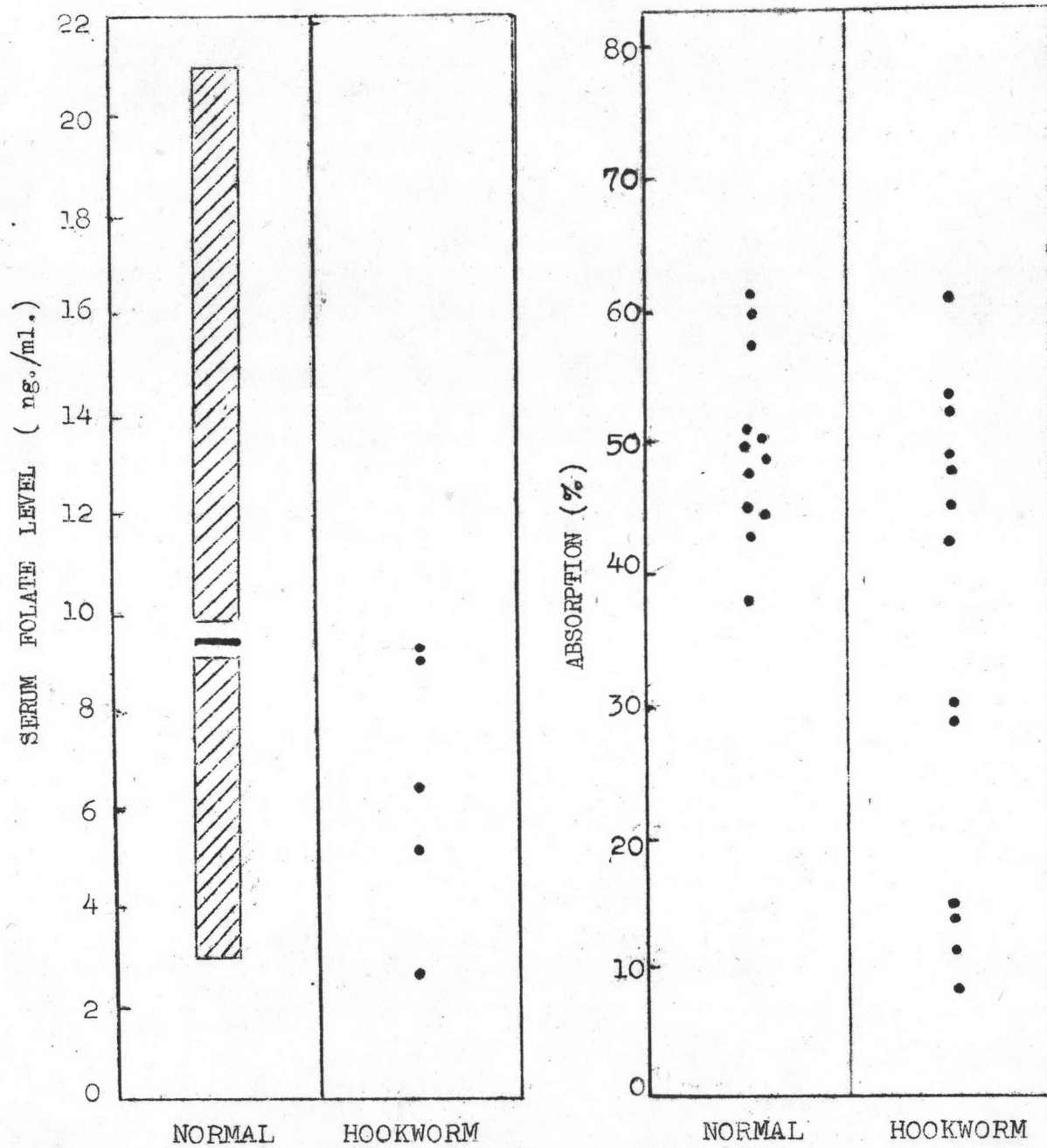


FIG. 3 Serum Folate Levels and Folic Acid Absorption in Patients with Hookworm Infection.

Table 9

Folic acid absorption in 13 patients with hookworm infection

No.	Sex	Hb. (g%)	Absorption (%)	No.	Sex	Hb. (g%)	Absorption (%)
1	M	3.8	28.4	8	M	2.8	45.0
2	M	13.0	13.5	9	M	8.4	47.8
3	F	12.2	42.0	10	M	11.3	48.5
4	M	9.6	14.3	11	F	7.0	52.0
5	M	5.8	30.0	12	F	3.4	8.0
6	M	3.2	11.0	13	M	7.7	53.0
7	M	9.1	60.5				

and the absorption were found to be  $6.5 \pm 2.8$  ng./ml. (range 2.7 - 9.3 ng./ml.) and  $34.9 \pm 18.4$  % (range 8.0 - 60.5 %) respectively and 6 out of 13 patients showed impaired absorption of this vitamin.

The figures obtained for serum folate levels and folic acid absorption in 10 patients with opisthorchiasis infection are illustrated in Fig. 4. These individual values are shown in Table 10 and 11.

Table 10

Serum folate level in 3 patients with opisthorchiasis infection

No.	Sex	Hb. (g%)	Serum folate level (ng./ml.)
1	M	12.2	4.2
2	M	14.1	3.67
3	M	-	6.1

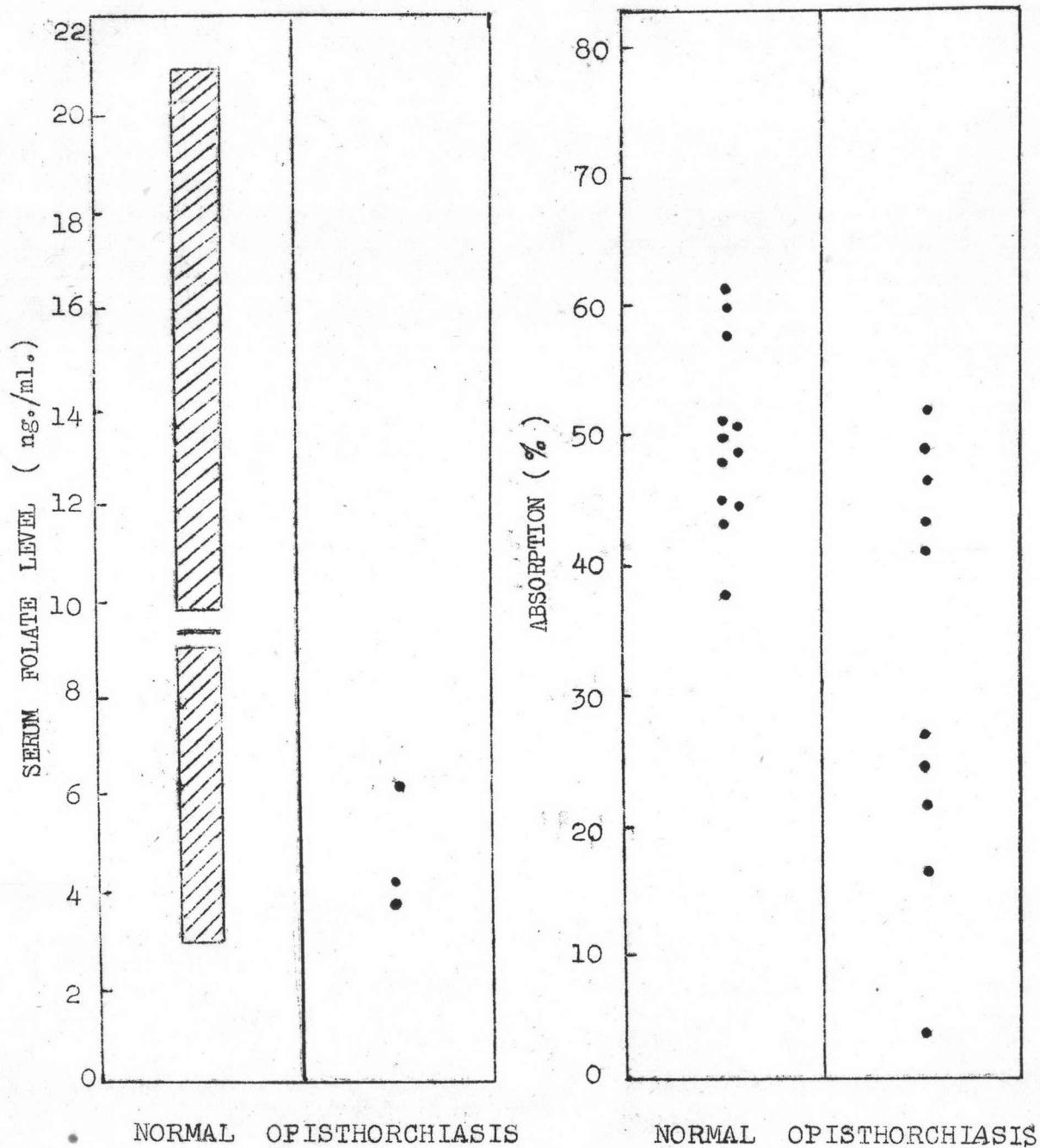


FIG. 4 Serum Folate Levels and Folic Acid Absorption in Patients with Opisthorchiasis Infection.

Table 11

Folic acid absorption in 10 patients with  
opisthorchiasis infection

No.	Sex	Age	Hb. (g%)	Absorption (%)	No.	Sex	Age	Hb. (g%)	Absorption (%)
1	M	57	11.2	43.1	6	F	51	10.6	26.8
2	M	52	11.4	24.7	7	M	43	15.3	48.7
3	M	28	8.4	16.0	8	M	24	16.7	41.1
4	M	37	10.3	3.6	9	M	24	15.3	51.9
5	M	44	11.8	21.3	10	M	33	13.3	46.5

A mean value  $\pm$  one S.D. of folic acid absorption in 10 patients was found to be  $32.4 \pm 16.16\%$  (range 3.6 - 51.9 %) with 5 out of 10 showing an impaired absorption.