Distribution of *Schistosoma haematobium* Infection in Kwale District of Coast Province, Kenya

John H. OUMA[1], Edith WAMBAYI[1], Fredrick W. THIONGO[1], Masaaki SHIMADA[2]* and Yoshiki AOKI[2]

[1] *Division of Vector Borne Diseases, Ministry of Health, Nairobi, Kenya*
[2] *Department of Parasitology, Institute of Tropical Medicine, Nagasaki University, Nagasaki, Japan*

Abstract: The study was carried out to determine the geographical distribution of *Schistosoma haematobium* infection in Kwale district, Kenya in 1981. Urine specimens were obtained from the pupils of the standard 4, 5 and 6 in 41 schools selected from 135 schools in Kwale district. Out of 2638 children, the ova of *S. haematobium* were detected in 41.2% by centrifugation of urine suggesting the widespread distribution of *S. haematobium* in the district. The infection rate was significantly higher in males than in females. Among four administrative divisions, the highest infection rate was observed in Kinango and a high endemic area was also found in Southern division. The infection rates in Kubo and Central divisions were relatively low. *S. haematobium* infection was highly prevalent in the southern part of coastal area in Kenya.

Key words: Schistosoma haematobium, Geographical distribution, Kwale, Kenya

INTRODUCTION

It had been well known that *Schistosoma haematobium* infection is widely prevalent in Coast province, Kenya and had been recognized as one of the important health problem in the country (Highton, 1974). In 1979, Warren et. al. (1979) showed a clear correlation between urinary tract lesion and the intensity of infection, and the health importance of the disease was well understood. Accordingly, in 1981, a research programme on the disease in the southern part of the coastal area, Kwale district, was planned to start as a Kenya-Japan joint programme in order to determine the transmission dynamics of the disease in the area.

However, the general information available in the area had not been well organized and scanty to start an effective detailed research. Therefore, it was considered to be essential as a first step of the programme to gather sufficient data regarding the distribution of the disease in order to establish an adequate meaningful *S. haematobium* infection research. The study, an initial parasitological survey, was carried out in Kwale district from September to

Received for publication, October 1, 1997
Contribution No. 3493 from the Institute of Tropical Medicine, Nagasaki University
*Present address; Information and Reference Center, Institute of Tropical Medicine, Nagasaki University, Nagasaki, Japan

November in 1981 to obtain a sketch map of distribution of *S. haematobium* which would be useful to choose a pilot research field.

Materials and Methods

Out of the 135 primary school in Kwale district, 41 (30%) were chosen for the studies; 11 in Kinango, 8 in Central, 7 in Kubo and 15 in Southern divisions. The locations of these schools and the geographical overview was described in the other paper (Shimada et al., 1997). The students of standard 4, 5 and 6 were examined for ova of *S. haematobium* in urine by a sedimentation method since they had been expected to belong to the 9−11 year-age-group which should have had a highest prevalence and were supposed to be good indicators of the infection.

The samples were collected at each school and brought back to the laboratory for the examination. In most case, whole quantity of urine was collected in 300 ml plastic container between 10 a.m. and 2 p.m.. In some cases, 20 or less ml glass container was used due to the lack of big containers and the collection time of urine was sometimes after 2 p.m. if the school was distant from the laboratory. The urine samples were kept in a refrigerator overnight without any preservatives. The supernatants were discarded and the remains were centrifuged by 1800 rpm for 10 min., and the sediments were observed under the microscope for the detection of ova.

Results

Results are shown in Table 1 according to schools. Schistosomiasis haematobia was found to be distributed in every school in a great degree with a few exceptions. As a whole, out of 2638, 1547 of males and 1091 of females, 1086 school children or 41.2 percent were detected to be positive. The infection rate was significantly higher in males (43.8%) than in females (37.4%) ($P<0.001$). The age calculated from the birth year informed by students ranged from 6 up to 22. Although some of the ages informed were considered not to be reliable, the children were divided into four age-groups. Thus, there was no statistically significant differences observed among age-groups (Table 2).

The infection rates differed from school to school even in each division (Figure 1). However, when they were lumped together according to the administrative area, a marked difference on the infection rates was observed among divisions. The infection rate was highest in Kinango and was also high in Southern. The other two divisions showed relatively low infection rates.

Table 1. Infection of *S. haematobium* in each school

School	Location	MALE Examined	MALE Positive	MALE (%)	FEMALE Examined	FEMALE Positive	FEMALE (%)	TOTAL Examined	TOTAL Positive	TOTAL (%)
Mwagodzo	B-01	21	10	(48)	35	10	(29)	56	20	(36)
Lukore	B-03	58	17	(29)	53	13	(25)	111	30	(27)
Shimba Hills	B-07	34	5	(15)	35	6	(17)	69	11	(16)
Majimboni	B-08	66	23	(35)	52	23	(44)	118	46	(39)
Mwapala	B-09	50	20	(40)	52	18	(35)	102	38	(37)
Baakanda	B-13	38	22	(58)	15	10	(67)	53	32	(60)
Kibuyuni	B-20	32	4	(13)	33	0	(0)	65	4	(6)
Subtotal		299	101	(34)	275	80	(29)	574	181	(32)
Ngonzini	G-05	25	23	(92)	4	4	(100)	29	27	(93)
Nzovuni	G-07	18	18	(100)	8	6	(75)	26	24	(92)
Mazola	G-08	33	25	(76)	20	17	(85)	53	42	(79)
Yapha	G-09	19	16	(84)	1	1	(100)	20	17	(85)
Mtaa	G-11	23	17	(74)	11	9	(82)	34	26	(76)
Makamini	G-15	13	8	(62)	2	2	(100)	15	10	(67)
Vigorungani	G-19	49	32	(65)	9	8	(89)	58	40	(69)
Mtumwa	G-23	32	19	(59)	5	2	(40)	37	21	(57)
Mwalukombe	G-26	26	20	(77)	20	13	(65)	46	33	(72)
Kilimangodo	G-32	32	18	(56)	19	10	(53)	51	28	(55)
Chanzou	G-35	23	2	(9)	0	0		23	2	(9)
Subtotal		293	198	(68)	99	72	(73)	392	270	(69)
Ngombeni	C-01	54	12	(22)	60	8	(13)	114	20	(18)
Pungu	C-04	68	19	(28)	48	12	(25)	116	31	(27)
Moweka	C-08	40	19	(48)	27	7	(26)	67	26	(39)
Vinuni	C-11	24	8	(33)	14	6	(43)	38	14	(37)
Mwaligulu	C-14	64	20	(31)	51	20	(39)	115	40	(35)
Bilashaka	C-17	34	15	(44)	34	16	(47)	68	31	(46)
Mwamgunga	C-18	37	20	(54)	36	11	(31)	73	31	(42)
Goloni	C-21	67	16	(24)	38	6	(16)	105	22	(21)
Subtotal		388	129	(33)	308	86	(28)	696	215	(31)
Chuwuni	S-02	49	15	(31)	21	5	(24)	70	20	(29)
Ngadhini	S-03	31	16	(52)	19	10	(53)	50	26	(52)
Mwalewa	S-04	27	9	(33)	14	2	(14)	41	11	(27)
Washini	S-11	19	2	(11)	11	0	(0)	30	2	(7)
Ramisi	S-18	52	24	(46)	50	18	(36)	102	42	(41)
Mwachande	S-20	16	7	(44)	10	3	(30)	26	10	(38)
Mwaembe	S-21	49	37	(90)	41	37	(90)	90	74	(82)
Jomo Kenyatta	S-24	40	28	(70)	30	20	(67)	70	48	(69)
Mwangulu	S-35	60	37	(62)	19	11	(58)	79	48	(61)
Mwandeo	S-38	31	1	(3)	43	1	(2)	74	2	(3)
Kilulu	S-40	18	3	(17)	23	6	(26)	41	9	(22)
Mivumoni	S-42	63	17	(27)	61	17	(28)	124	34	(27)
Nguluku	S-43	33	13	(39)	24	10	(42)	57	23	(40)
Maumba	S-44	36	4	(11)	14	6	(43)	50	10	(20)
Sham	S-48	43	37	(86)	29	24	(83)	72	61	(85)
Subtotal		567	250	(44)	409	170	(42)	976	420	(43)
Total		1547	678	(44)	1091	408	(37)	2638	1086	(41)

Table 2. Infection of *S. haematobium* in each age-group

Age-group	MALE No. Examined	MALE Positive	MALE (%)	FEMALE No. Examined	FEMALE Positive	FEMALE (%)	TOTAL No. Examined	TOTAL Positive	TOTAL (%)
6- 9	19	6	(31.6)	14	5	(35.7)	33	11	(33.3)
10-14	850	365	(42.9)	747	268	(35.9)	1597	633	(39.6)
15-19	509	241	(47.3)	228	89	(39.0)	737	330	(44.8)
20-22	16	9	(56.3)	2	0	(0.0)	18	9	(50.0)
Unknown	153	57	(37.3)	100	46	(46.0)	253	103	(40.7)
Total	1547	678	(43.8)	1091	408	(37.4)	2638	1086	(41.2)

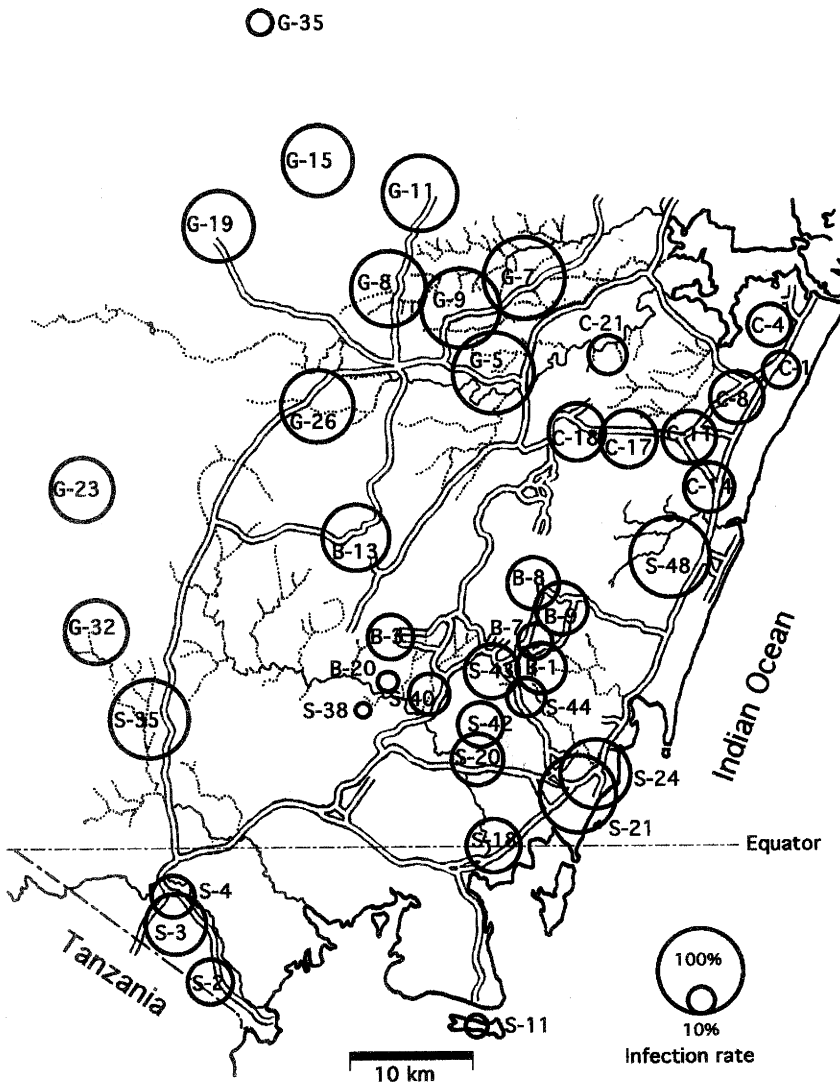

Figure 1 Distribution of Schistosomiasis haematobia in Kwale, Kenya.

DISCUSSION

Although the study covered only one-third of the primary schools, a rough sketch map on the distribution of *S. haematobium* infection in Kwale district was obtained. From the results, it could be expected that in Kwale district, *S. haematobium* infection was widely distributed and prevalent among inhabitants.

It is usually observed in Kenya that the people live in dry area show lower infection rate. Highton (1974) reported that Teesdale had recorded lower infection rate in drier area in Tana river district, the northern part of coastal margin. It was also reported that the children who lived at a distant place from the lake showed lower infection rate (Masaba, 1980a). However, in our study, the highest infection rate was observed in Kinango where its climate is the driest. Although there are a number of factors which connect with the transmission of schistosomiasis, our results probably indicate that in this dry area the limited water sources are easily contaminated with human excreta and consequently the infection of snails may fully established. This hypothesis could be supported by the similar geographical distribution of *Entamoeba coli* in this area (Shimada et al., 1997), which is considered to be a good indicator of water contamination with feces.

Highton (1974) reported that the infection rate of pupils at a school in Shimba Hills was 100% in early 1970's. However, in our study, the infection rate was 32% in average and 60% at maximum in one school in Shimba Hills area. The reason was not pursued but there might be a possibility that the infection rates had been declined in several places because of the complex of the improvement of sanitary conditions, the health education and the clinical treatment of people. The higher infection rate in dry area observed in our study might be merely due to the relatively low infection rate in the other area which had been provided by the improvement of sanitary condition during the 1970's.

The infection rates in most of the schools were more than 20%. However, the rates were very low in some schools. The reason why there were some area where most of the children had not been infected was not pursued in this study. The very low infection rate in 4 schools and the differences in the infection rate among divisions might reflect the differences in populations on the vector snails in these areas. It will be necessary to carry out the snail survey in future in order to determine the distribution of vector snails.

Our results showed higher infection rate in males than in females. The similar results has been reported in other places in Kenya (Ouma and Waithaka, 1978; Masaba, 1980a and 1980b). The difference of behavior pattern in water contact is one of the possible reason for this evidence.

ACKNOWLEDGEMENTS

This study was conducted under the Kenya-Japan Communicable Diseases Research and Control Project, supported by the Kenya Medical Research Institute (KEMRI) and the

Japan International Cooperation Agency (JICA). We express appreciation to Professor M. Mugambi (Director of KEMRI), Dr. T. K. Arap Siongok (Director, Division of Communicable Disease Control), Dr. J. N. Kaviti (Director, National Public Health Laboratory Services) and Dr. D. K. Koech (Director, Division of Vector Borne Diseases) for their kind support to this study. We are grateful to the late Mr. P. Bebora and his staff in D.V.B.D., Mombasa; Mr. Saidi, Chief field worker; Headmaster of Mwachinga Primary School; and children's parents for their excellent work and the best cooperation. We also would like to thank Mr. K. Onoda, project coordinator, whose administrative efforts made this study possible.

REFERENCES

1) Highton, R. B. (1974): Schistosomiasis. *In*: L. C. Vogel, A. S Muller, R.S. Odingo, Z. Onyango, & A. P. De Geus, (ed.). Health and Disease in Kenya, East African Literature Bureau, Nairobi.
2) Masaba, S. C. (1980a): Urinary schistosomiasis in Homa Bay district, Kenya. Kenya J. Sci. Tech. (B), 1, 71.
3) Masaba, S. C. (1980b): The epidemiology of schistosomiasis in Kisumu Municipality, Medicom, 2, 47.
4) Ouma, J. H. & Waithaka, F. (1978): Prevalence of *Schistosoma mansoni* and *Schistosoma haematobium* in Kitui district, Kenya. E. Afr, Med. J., 55, 54.
5) Shimada, M., Hirata M., Ouma, J. H., Gatika, S. M. & Aoki Y. (1997): Intestinal parasitic infections of school children in Kwale district of Coast province, Kenya. Tropical Medicine, 39, 57−64.
6) Warren, K. S., Mahmoud, A. A., Muruka, J. F., Whittaker, L. R., Ouma, J. H. & Siongok, T. K. A. (1979): Schistosomiasis haematobium in Coast province Kenya. Relationship between egg output and morbidity. Am. J. Trop. Med. Hyg., 28, 864.