Preliminary Report of the 8th Selective Mass-Chemotherapy of Urinary Schistosomiasis in Mwachinga Community of Kwale District, Coast Kenya

Mwachinga Schistosomiasis Control Study Group[1]

Abstract A selective mass-chemotherapy of urinary schistosomiasis was conducted in Mwachinga community of Kwale District, Coast Province of Kenya in August, 2001 after three and a half years since the last urine examination and treatment. Overall, 1118 villagers participated in urine examination. Urine of 1088 villagers was studied for eggs of *schistosome haematobium*. Egg-positives were 572 out of 1088 villagers, prevalence being 53%. Prevalence among males (56%, 283/508) was higher than females (49%, 290/580). Prevalence was 19% for gross-haematuria, 55% for micro-haematuria, 60% for proteinuria, 44% for self-diagnosed schistosomiasis, 40% for self-reported symptoms of blood in urine, 51% for pain in urination, 40% for difficulty in urination, and 48% for sense of remaining urine. Ninety-two percent of egg-positives (528/572) were treated with praziquantel. Results of anthropometry, self-reported water contact, blood pressure, and medical examination are also reported.

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Key Words : schistosomiasis, *Schistosome haematobium*, Mass-chemotherapy, self-diagnosis, Kenya

Introduction

Urinary Schistosomiasis caused by infection of *Schistosome haematobium* is a serious public health problem in Kwale District of Coast Province of Kenya. To identify the epidemiology, transmission, morbidity, and control measures of the infection, an integrated study and intervention was conducted in a community, Mwachinga, by a Kenyan-Japanese team since 1981 (See related references in Aoki ed., 1993; Aoki et al. eds., 1994; Moji et al., 1998). The project started as an international cooperation between Kenya Medical Research Institute (KEMRI) and Japan International Cooperation Agency (JICA). After the end of the KEMRI/JICA project in 1996, the project was continued on a smaller size by research funds from Japanese Ministry of Education, Science, Culture and Sports to Prof. Aoki and to Prof. Moji. The project made selective community mass-chemotherapy since 1984. The last chemotherapy was the seventh one conducted in February 1998.

In August 2001 the eighth selective mass-chemotherapy was conducted. The selective mass-chemotherapy is a control measure targeting all the people in a community, carrying out urine examination and treating those who are egg-positive. At the same time, an interview survey of behaviour and symptoms, anthropometry, medical examination of school children, and blood pressure measurement of adults were conducted. This preliminary report describes results of this field operation. The main purpose of the study is to control schistosomiasis in the community and to understand its re-infection rate by repeating ses-

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sions of selective mass-chemotherapy. At the same time, we intended to expand health services from schistosomiasis specific control to a larger perspective of community health control.

This preliminary report was written for a purpose of informing the main descriptive results to those who are interested in control and study of urinary schistosomiasis. Usually, scientific publication takes time to be available for those people. The time lag between the field operation and the scientific publication may cause delay in necessary control actions in the community. We believe that quick return of first-hand information is necessary and essential to get good co-operation and collaboration from the community, the local health authorities, and other stake-holders (Montresor et al., 1998, 1999). It is also ethically appropriate to make basic information available as early as possible.

In this preliminary report, described are prevalence and intensity of infection, prevalence of visual and micro-haematuria, proteinuria, self-diagnosis, subjective symptoms, as well as self-reported water-contact behavior, results of anthropometry, medical/physiological examination and measurements of blood pressure by sex and age group. Plans of further analyses are also discussed in this report.

Procedures

Time schedule of the field operation: Time schedule of the field operation is listed in Appendix 1. In summary, nine working days were allocated for urine-examination and the following four working days were allocated for treatment. In the first three days of treatment, we also did urine examination for those who failed to come to urine examination during the previous 9 days. Urine examination was conducted in three places of the community, Kibaoni, Mwachinga (at Mwachinga Community Dispensary next to the primary school of the community), and Mailnane. Treatment with praziquantel of 40mg/kg body weight was all done at the dispensary. A community meeting, *baraza*, was held one day before the start of urine examination in presence of Chief of Kinango division. About 150 villagers attended at the *baraza*. An invitation card indicating the day to come for urine examination was given to each household member after the *baraza*. Local staffs of the community dispensary took a village census by a house-to-house visit prior to the urine-examination.

Daily procedure of urine examination: Daily procedure of urine examination is summarised in Appendix 2. Registration started from 10:00. Name, sex, age, one's number of household and individual number within a household (HH/ID, checked by using the community census book) were recorded in a recording sheet (Appendix 3) and a urine cup with one's HH/ID written was handed. Participants were asked to answer questions on self-diagnosis, four subjective symptoms (blood in urine, pain in urination, difficulties in urination, and sense of remaining urine after urination), and contact with river water in the past two weeks. Then participants went for urination and first urine was collected from 10:30 and the time of collection was recorded on one's sheet. Colour of urine, red, pink or yellow was recorded. Urine of red and pink was judged as gross-haematuria. Micro-haematuria and proteinuria as well as ketone, urobilin, glucose in urine and pH of urine were checked by a reagent strip and recorded on the recording sheet.

Participants were asked to wait for one hour after collection of the first urine. During this one hour, anthropometry (body weight and height for all the participants and upper arm circumference for school children) was done. Medical examination of the chest, abdomen (liver and spleen) and colour of conjunctiva were done for school children. Blood pressure of adults was measured.

A second urine container of 1000ml with one's HH/ID number written was given to each participant after one hour since collection of first urine, and participants were asked to urinate all urine in to the container. Then one's second urine and recording sheet were collected, with time of collection written on the sheet. Each container was covered with a top and brought back to the KEMRI Kwale Laboratory. First urine collection was terminated at 12:30, so as to finish second urine collection by around 13:30. Some of young children could not give the second urine. We tried to keep first urine of young children to prepare for such cases.

Filtration of urine and egg counting: Urine was filtrated in the laboratory in the afternoon of the day collected. If urine was found egg-positive after a filtration of some volume, the volume of urine filtered and the total volume were recorded so as

to calculate the number of eggs in the total urine. If there was no egg by a filtration of a part of all volume, all the volume of urine was filtrated to confirm negative. Egg counting was done on the next day by laboratory technologists, and the total number of eggs per one hour was calculated for all the second urine. For those who failed to give second urine (mostly small children), their first urine (if reserved) was filtered and checked. For those who came to urine examination during days for treatment, we only collected the first urine because of shortage of manpower, and urine of 10 ml was filtrated. Intensity was measured only for second urine in this report.

Questionnaires: No questions were asked for those who came urine examination during days of treatment. Small children did not answer to questions either.

Data input and analysis: All the data of a day was inputted into a SPSS data file by the next day. Simple tabulation and cross-tabulation by sex and age group were done for this preliminary report.

Treatment: An invitation card for treatment was sent out for each household, any of which members was egg-positive. School children, and community members delivered the cards. Treatment started around 9:30. Recording sheets of egg positives were sorted according to their HH/ID numbers. Participants were identified and one's sheet was handed. A clinical officer from Kwale Sub-District Hospital prescribed a dose of praziquantel according to one's weight (40mg/kg body weight, 1 tablet of 600mg/15kg of body weight) and wrote the dose into one's sheet with his signature. Then a nurse gave that dose of the drug with water, and confirmed that the drug was swallowed.

Preliminary results of the study

Numbers of people registered, attended, infected (egg-positive), and treated by age-group are listed in Table 1 (males) and in Table 2 (females).

Demography: Before the mass-chemotherapy, local staff of Mwachinga dispensary took census of the village. There were 1859 villagers, 877 males and 982 females, in the village. Because of lack of job opportunities and other reasons, some of them were frequently staying outside of the village. Therefore the census was for a *de jure* population rather than a *de facto* population.

Number of participants: Overall, 1118 villagers, 522 males and 595 females (one infant missing data for sex) were participated into urine examination held between 3 and 14 of August 2001. Urine of 1088 villagers was studied for eggs of *schistosome haematobium*. 30 failed to give urine for filtration. Children under 14 years occupied more than a half of the participants. Participation rate in the urine examination was 60%, 59% for males and 60% for females.

Prevalence of infection: Overall, 572 out of 1088 villagers were egg-positive, prevalence being 52.6%. Prevalence among males (55.6%, 283/508) was higher than females (48.7%, 290/580).

Participation into treatment: Out of all the 572 egg-positives, 528 villagers (92%) were treated by praziquantel. For other positives, praziquantel is to be given in the community dispensary with free of charge by September.

Prevalence by age group: Prevalence of schistosomiasis (egg-positives) by age group is shown in Tables 1 and 2, and Figure 1. Prevalence was highest among 10-14 years old children (84%, boys being 85% and girls being 83%). The second high prevalence was observed among 15-19 years old (76%). There was no significant difference of prevalence in these age groups.

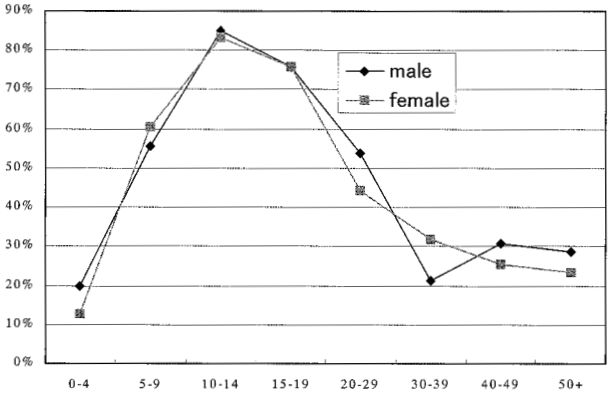

Fig. 1 Prevalence of schistosomiasis (egg-positives) by age group Mwachinga, August 2001 (three and a half year after the previous treatment)

Table 1. Age-distribution of census, population, participation rate in urine exam, prevalence of egg-positives, and participation rate for treatment (male, 2001)

Age group (years old)	Census population	attended	participation rate in urine examination	positive	egg-tested	prevalence rate of egg positives*	treated	participation rate in treatment
0-4	127	78	61.4%	14	71	19.7%	12	85.7%
5-9	147	92	62.6%	50	90	55.6%	45	90.0%
10-14	182	141	77.5%	119	140	85.0%	110	92.4%
15-19	110	66	60.0%	50	66	75.8%	45	90.0%
20-24	58	22	37.9%	14	22	63.6%	13	92.9%
25-29	51	19	37.3%	8	19	42.1%	8	100.0%
30-34	36	12	33.3%	2	12	16.7%	2	100.0%
35-39	35	16	45.7%	4	16	25.0%	4	100.0%
40-44	27	14	51.9%	3	13	23.1%	3	100.0%
45-49	30	16	53.3%	6	16	37.5%	6	100.0%
50-54	17	8	47.1%	1	8	12.5%	1	100.0%
55-59	12	8	66.7%	2	7	28.6%	2	100.0%
60-64	11	8	72.7%	4	7	57.1%	4	100.0%
65-69	12	7	58.3%	2	7	28.6%	2	100.0%
70-79	16	9	56.3%	2	9	22.2%	2	100.0%
80-	6	4	66.7%	1	4	25.0%	1	100.0%
Total	877	520	59.3%	282	507	55.6%	260	92.2%

Table 2. Age-distribution of census, population, participation rate in urine exam, prevalence of egg-positives, and participation rate for treatment (female, 2001)

Age group (years old)	Census population	attended	participation rate in urine examination	positive	egg-tested	prevalence rate of egg positives*	treated	participation rate in treatment
0-4	124	84	67.7%	10	78	12.8%	9	90.0%
5-9	136	99	72.8%	57	94	60.6%	49	86.0%
10-14	172	120	69.8%	100	120	83.3%	93	93.0%
15-19	111	62	55.9%	47	62	75.8%	44	93.6%
20-24	94	43	45.7%	20	43	46.5%	20	100.0%
25-29	75	38	50.7%	16	37	43.2%	15	93.8%
30-34	61	32	52.5%	11	32	34.4%	9	81.8%
35-39	36	19	52.8%	5	19	26.3%	5	100.0%
40-44	44	23	52.3%	4	23	17.4%	4	100.0%
45-49	31	20	64.5%	7	20	35.0%	6	85.7%
50-54	23	14	60.9%	2	14	14.3%	2	100.0%
55-59	20	12	60.0%	2	11	18.2%	2	100.0%
60-64	15	8	53.3%	2	8	25.0%	2	100.0%
65-69	16	11	68.8%	4	11	36.4%	4	100.0%
70-79	16	5	31.3%	1	5	20.0%	1	100.0%
80-	8	3	37.5%	1	2	50.0%	1	100.0%
Total	982	593	60.4%	289	579	49.9%	266	92.0%

Intensity: Intensity of egg per hour was collected for 449 males and 512 females. The highest egg count was 25000 eggs per one hour of urine. Arithmetic mean of egg counts was 603 for male and 511 for female. Geometric mean including the negatives was 15.5 (log (egg+1)=1.2168 with SD of 1.3876) for male and 9.2 (log (egg+1)=1.0078 with SD of 1.3122) for female.

Intensity among positives: Geometric mean only for positives was 246.0 (log (egg+1)=2.3927 with SD of 0.9328, n=444); 288.0 for male (2.4609, 0.9096, n=222) and 210.1 for female (2.3244, 0.9526, n=222).

Intensity among positives by age group: Intensity among positives by age group is shown in Figure 2. Boys of age 10-14 showed the highest intensity of 539 eggs per one hour of urine. Girls of this age group also showed the highest intensity among females (342 eggs per one hour of urine).

Severity of infection: Among 444 egg-positives of whose intensity was known, 30% were severely infected (more than 1000 eggs per hour), and other 46% were moderately infected (50-999 eggs per hour). The rest were mildly infected (1-49 eggs per hour). The proportions of each category did not change much by sex (51, 100, 71 for males, and 55, 104, 63 for females, respectively). Including negatives, 14% were heavily infected and 21% were moderately infected. Severity of infection by sex and age is shown in Figure 3.

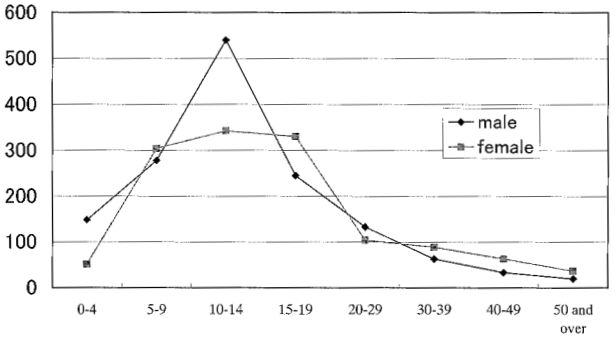

Fig. 2 Intensity per egg-positive by age group (geometric mean of eggs per one hour of urine)

Gross-haematuria: Visual haematuria judged by colour of urine (pink, red) was observed for 19% of participants (209/1080, pink for 142 participants and red for 67 participants). There was no brown urine observed this time. Prevalence was 22.7% formales and 16.5% for females. Prevalence of gross-haematuria by sex and age group is shown in Figure 4.

Micro-haematuria: Micro-haematuria by reagent strips was found in 55% of participants (601/1098, 55.8% for males and 53.8% for females). Prevalence

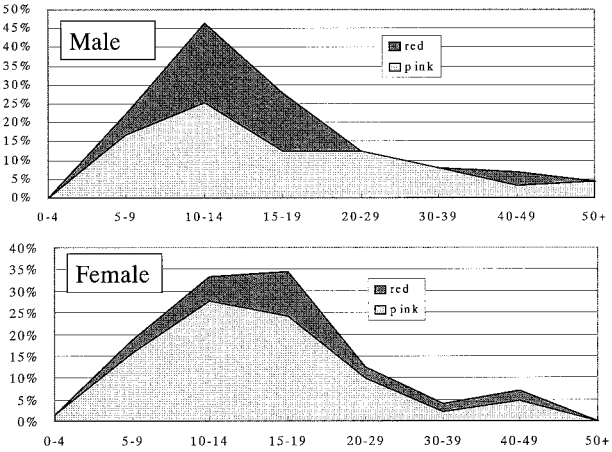

Fig. 4 Visual haematuria (color of urine), Mwachinga 2001

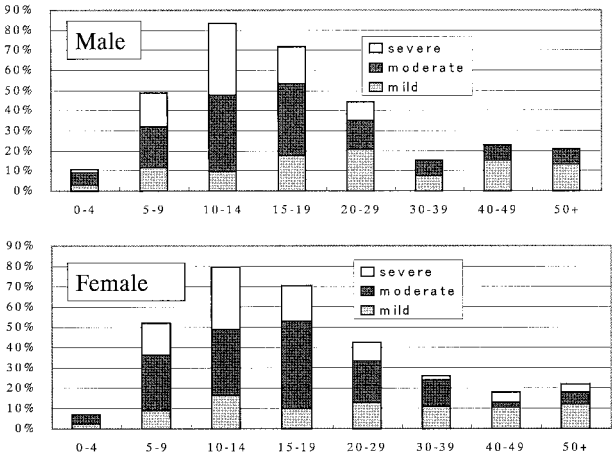

Fig. 3 Severity of infection by egg-count by age (Mwachinga 2001)

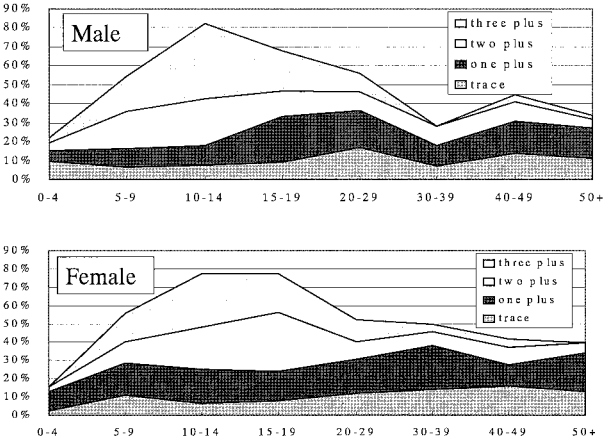

Fig. 5 Prevalence of micro-haematuria (Mwachinga 2001)

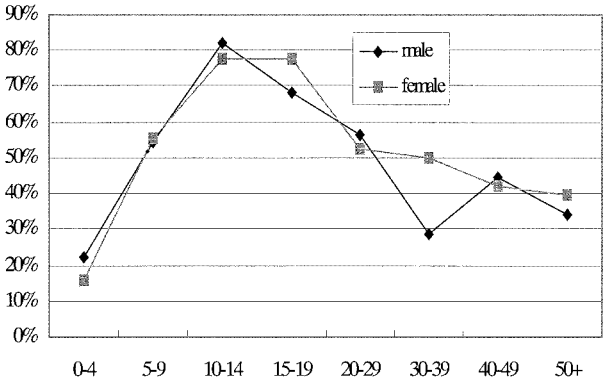

Fig. 6 Prevalence of micro haematuria by sex and age (Mwachinga 2001)

of 3+, 2+, 1+, and trace (±) was 15.5%, 14.1%, 14.9%, and 9.4%, respectively. Prevalence by sex and age group is shown in Figures 5 and 6.

Micro-proteinuria: Prevalence of proteinuria by reagent sticks was 59.6% (654/1097, 62.3% for males and 57.3% for females). Prevalence of 3+, 2+, 1+, and trace (±) was 4.6%, 14.7%, 23.6%, and 16.8%, respectively. Prevalence by sex and age group is shown in Figure 7. Prevalence of proteinuria was higher than that of micro-haematuria in adults.

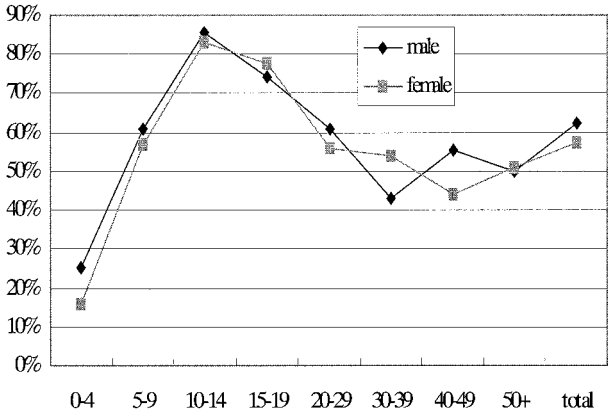

Fig. 7 Prevalence of proteinuria by sex and age (Mwachinga 2001)

Self-diagnosis: For self-diagnosis of schistosomiasis, 44% (293/661) responded that they had schistosomiasis at the moment, 20% did not know, and the other 35% responded negatively. Males self-diagnosed more than females (54.3% vs. 36.4%). Prevalence of self-diagnosed urinary schistosomiasis by sex and age group is shown in Figure 8.

Subjective-symptoms: Prevalence of the four subjective symptoms by age group is shown in Figure 9 for male and in Figure 10 for female.

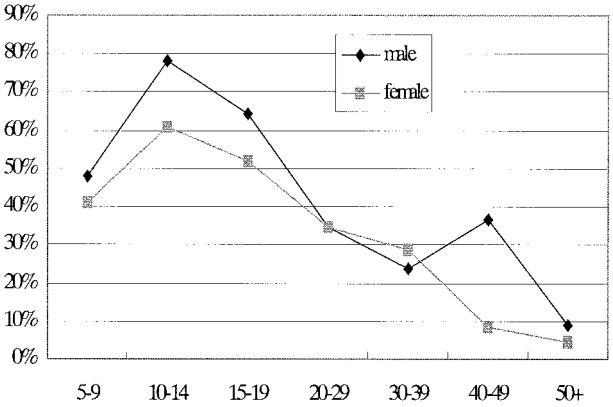

Fig. 8 Prevalence of self-diagnosed schistosomiasis by sex and age

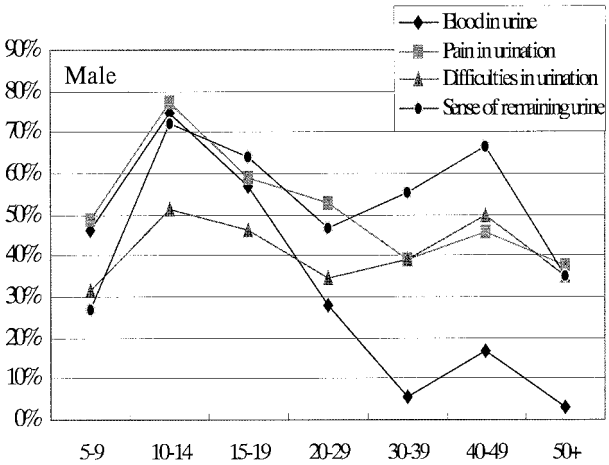

Fig. 9 Prevalence of subjective symptoms by age group, male

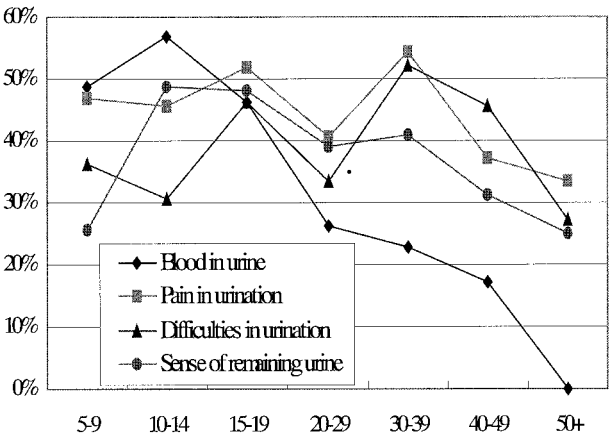

Fig. 10 Prevalence of subjective symptoms by age group, female

1. **Blood in urine:** 40% (282/703) of participants, 47% of males and 34% of females, self-reportedly had blood in urine.
2. **Pain in urination:** 51% of participants, 59% of males and 44% of females, had pain in urination.
3. **Difficulties in urination:** 40% of participants (283/699), 44% of males and 37% of females had

difficulties in urination.

4. **Sense of remaining urine after urination:** 48% of participants (330/693), 57% of males and 39% of females had sense of remaining urine even after urination.

Water contact: Self-reportedly, 54% (375/697) had contacted with river water in the previous two weeks. Figure 11 shows the proportion of villagers who contacted with river water by sex and age group.

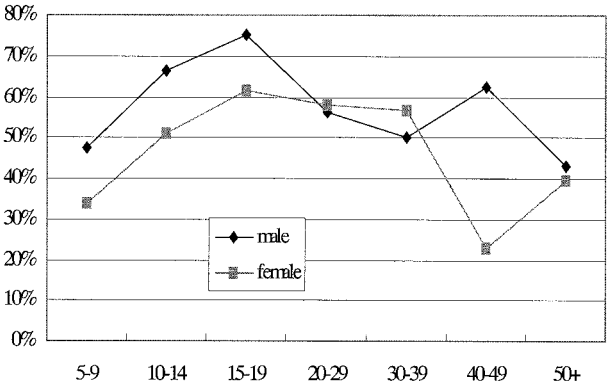

Fig. 11 Percentage of those who contacted with river water in the previous two weeks (Mwachinga 2001)

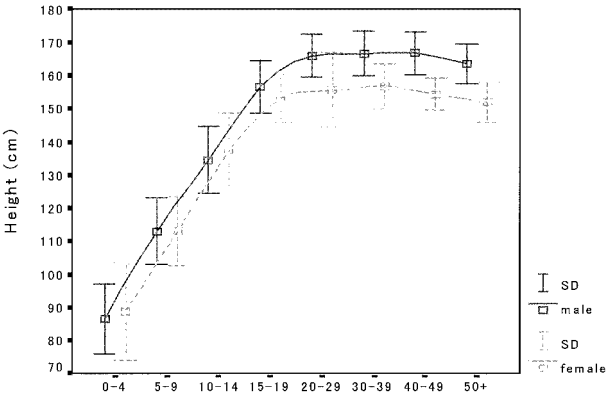

Fig. 12

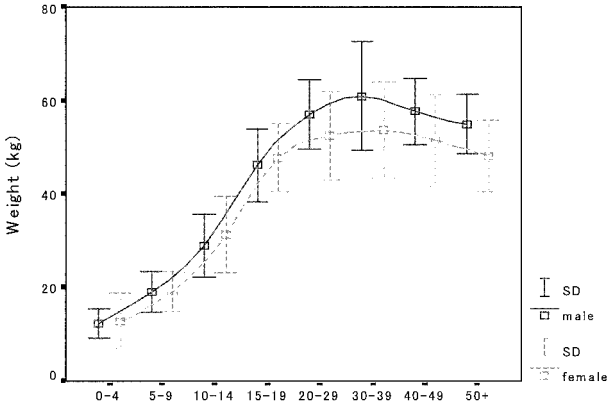

Fig. 13

Anthropometry: Weight, height, body mass index (BMI) and upper arm circumference (MUAC) are shown in figures 12-15 by sex and age group.

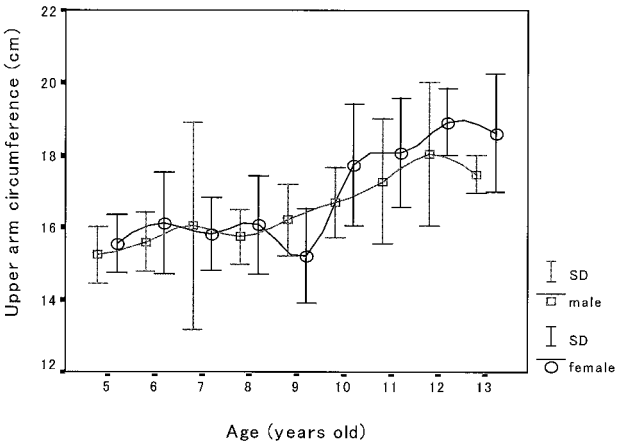

Fig. 14

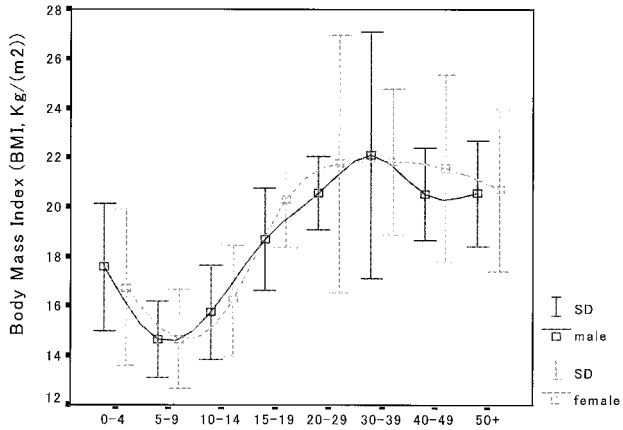

Fig. 15

Blood pressure: Mean systolic and diastolic blood pressure values with standard deviations and ranges were 122. 5 mmHg (16.9, 82-184, n=341) and 71.4 mmHg (11.4, 35-116, n=3419, respectively (Figures 16 and 17).

Urobilinogen, Ketone, pH, Glucose: 7.3% (11% for males and 4% for females) were urobilinogen plus. Four boys showed trace of ketone. Others were normal for ketone. No one showed abnormality in glucose. PH ranged from 5.0 to 8.0, 58% were pH 6.0.

Medical check: (Only for part of schoolchildren)

1. **Conjunctiva (anaemia):** Among 169 children examined 68% (70% of boys and 62% of girls) were anemic. 40% were plus/minus, 24% were plus one, and other 6 (3.6%) were judged as severely anemic.

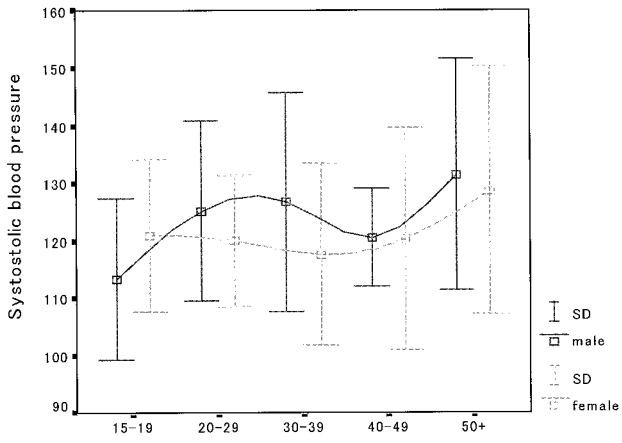

Fig. 16

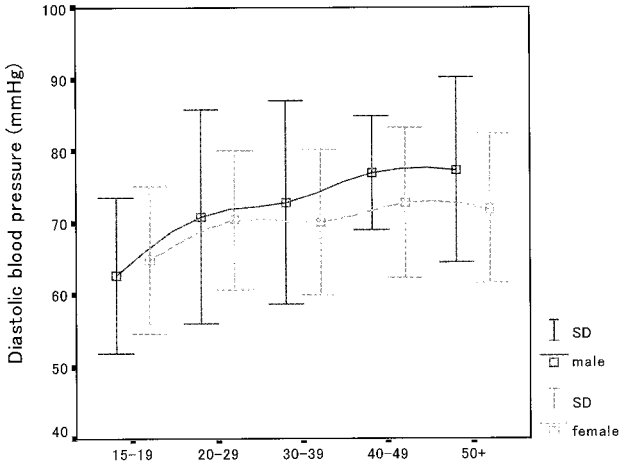

Fig. 17

2. **Chest:** Two boys and four girls out of 169 children (3.6%) showed signs of possible chest infection.
3. **Liver:** Enlargement of liver was seen in 25% of children (26% of boys and 23% of girls).
4. **Spleen:** Enlargement of spleen was seen in 18% of children (15% of boys and 23% of girls).

Concluding remarks

The 8th selective community mass-chemotherapy was much benefited by the existence of the community dispensary, which was established in 1998 through donations from the study group members. Census was updated before the urine examination, and identification of villagers became possible by the local staffs.

At the same time, introduction of the one-sheet system for registration, questionnaire, urine examination, and treatment increased the level of quality control of the field operation. Before, egg counting was conducted in Nairobi. The team needed two separate trips for urine-examination and treatment. Consequently, more cost and time were needed. This time, since duration between urine examination and treatment was short, more egg-positive villagers were able to come to the treatment. This time the coverage of treatment was as high as 92%. In short, the implementation of selective community mass-chemotherapy improved much and the staffs have learned lots about field operation and community activities.

Unfortunately, the prevalence of schistosomiasis increased much. It was obvious that a three and a half year interval was too long for a highly endemic area of urinary schistosomiasis. The reasons will be analysed in detail further in scientific papers. For example, a geographical analysis of infection within the community is planned. A study of factors associated with re-infection among schoolchildren is undergoing.

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Appendix 1. Time Schedule of Urine examination and treatment

23-27 July	Preparation in Nairobi
29 July	Travel: Nairobi-Kwale
30 July	Preparation for a community meeting
31 July	Community meeting (Barasa)
1-10 August	Urine Examination (9 days except Sunday) 1-2 Mwachinga dispensary (for school children) 3-4 Kibaoni 6-7 Mwachinga dispensary 8 Mailnane 9 Mailnane and Mwachinga dispensary 10 Kibaoni
11-15 August	Treatment (4days except Sunday) at Mwachinga dispensary Urine examination was also conducted in the first 3 days (by filtration of first urine).
16 August	Return to Nairobi

Appendix 2. Daily time schedule of urine examination

8:30-	Preparation in Laboratory	Setting filter in filter-holders
10:00-	Start registration	Identification of villagers, writing Household number and ID number, name, jender, and age
	Interview on self-diagnosis, symptoms, and water contact	A first urine cup is given (# HH/ID written)
10:30-	Start first urine collection	Time of first urine recorded
	Test by reagent stripes/ macro-haematuria	Participants wait for one hour
	Measurement of anthropometry (Weight, height, upper arm circumference)	
	Medical check for school-children (Chest, abdomen (lever and spleen), colour of conjunctiva)	
	Blood pressure for adults	
11:30-	Second urine collection	A Second urine container is given (# HH/ID written)
		One's container and recording sheet are collected and brought back to a laboratory Kwale . Time of second urine recorded
-13:30	Field operation finishs	
14:30-	Preparation for filtration in the laboratory	Urine containers and recording sheets are sorted by # HH/ID Writing # HH/ID on slide glasses
	Filtration of urine in the laboratory	
	Washing cups, containers, siringes, filter-holders	
Evening	Data input into a SPSS file	
Next day	Egg counting under microscope	Data inpute into computer and egg excretion per one hour of urine calculated

Appendix 3. Mwachinga 2001 Urine-examination and Treatment

Date: / August / 2001	Serial #

HH/ID-No: [ ] - [ ]

Name: _____(M / F) Age:_____

Job/class:_____

Do you think you have bilharzias (Schistosomiasis)? 1. Yes 2. No 3. Don't know

Have you contacted river/pond/dam/irrigation water in these two weeks? 1.Yes. 2. No

Do you have the following symptoms?

5. Blood in urine	1. Yes. 2. No. 3. No answer
6. Pain in urination	1. Yes. 2. No. 3. No answer
7. Difficulties in urination	1. Yes. 2. No. 3. No answer
8. Sense of remaining urine after urination	1. Yes. 2. No. 3. No answer

Time of the first urine: [ ]

Result Urine Exam: Color:_____Blood:_____Protein: _____

(Urobilin: normal, 1, 2 ,4, 8) (pH)

(Ketone: normal, +/-, +, ++, +++,++++)

(Blood sugar: normal, +/-, +, ++, +++,++++)

Blood pressure: systolic _____ mmHg diastolic _____ mmHg

Height _____ cm Body weight _____ kg MUAC _____ cm

Time of the second urine: [ ]

Schistosome h (Positive Negative) Egg count:_____

Treatment Date: ____/ Aug. / 2001

Tablets given: _____ **Check for treatment** [ ]