SCHSTOSOMIASIS IN THE FINCHAA RIVER VALLEY, WELLEGA REGION, WESTERN ETIHIOPIA

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ABSTRACT: Parasitological and malacological surveys were carried out in the Finchaa Valley, Wellega Region, western Ethiopia. Stool examination of 960 persons in the 10 communities surveyed showed an average human prevalence of 12.4% for Schistosoma mansoni. Infected individuals were present in 6 communities, but prevalence was greater than 10% in only three of them, reaching 40% among school children in one community. In endemic localities, the intensity of infection in terms of eggs per gram of faeces were 200 and 199 among school children and farm labours respectively. The age specific prevalence and intensity of infection were highest among the 5-14 year age group. The intermediate host of S. mansoni, Biomphalaria pfeifferi were collected from three sites, but transmission was identified at only one site located in the lower portion of the valley. Bulinus truncatus, the potential intermediate host of S. haematobium in Ethiopia, was also present in the area. The occurrence of infected human subjects and snail intermediate host confirm that Schistosoma mansoni is well established in the valley, particularly in the lower portion where a large irrigation development is under way. In this report, the threat posed by both S. Mansoni and S. haematobium is discussed and the preventive/control measures to be taken are suggested. [Ethiop. J. Health Dev. 1993; 7(1):9-15]

INTRODUCTION

There is adequate evidences that water resource development schemes have led to the establishment and spread of schistosomiasis in Ethiopia (1-7). From a rare disease at the initiation of the development, the disease has shown an alarming increase in magnitude in a number of river basins such as the Awash River (4), Borkena River (5), and Beles River (7). The same disease has also been reported from other river basins like Wabe Shebele River (3), Baro River (8) and Omo River (10). The Finchaa River Valley, located in Wellega Region, western Ethiopia (fig. 1), is an area of tremendous economic importance. The Finchaa hydroelectric power, commissioned in 1972, has a capacity of producing 532 Giga Watt hours (GWh) per annum '(11). The hydroelectric reservoir comprises the Finchaa Lake and parts of the Chomen swamps and extends over an area of some 245 km2. In addition, another water reservoir with a surface area of 22.7 km2 was completed in 1985 on the Amerti River (fig.1) to divert some 70 million cubic meter of water to the hydroelectric reservoir per year (11) creating even larger water impoundment in the area. The land in the Finchaa Valley is fertile and suitable for large scale agriculture. While a State Farm has already been in operation since the 1980's it is planned to develop irrigated agriculture for sugar cane production at a cost of

close to USD 300 million (11). All of the development schemes certainly encourage an influx of people to the area for job opportunities and settlement. The unscreened itinerant population may be from schistosomiasis endemic areas of the country .Further, the increased water impoundment will increase human water contact activities, favour vector snail breeding and parasite transmission. This warrants early disease surveillance and control in

the area. Cognizant of this and to warn project planners/managers, the Institute of Pathobiology , Addis Ababa University, sent a team in early 1990 to do epidemiological and malacological studies

in the area. In this report the results of stool examination and snail survey in the Finchaa Valley and its vicinities are presented.

MATERIALS AND METHODS

Based on accessibility and suitability of the ecological setting for schistosomiasis transmission, six communities and four farm camps located in the Finchaa Valley and its vicinities were selected for collection of stool samples (fig.1). In the selected communities and camps, stool samples were obtained from about 10% randomly selected school children and family members of farm labourers. The specimens were _____

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processed by the modified Kato's method (12) in the field and microscopically examined in the laboratory.

Snail survey was carried out within the valley at human water contact points and favourable habitats using a standard scoop. The snails were then identified and counted. Biomphalaria pfeifferi, were individually placed in petri dishes, dissected and examined for human schistosome larvae under the dissecting microscope. Habitat characteristics such as type of water body, water temperature and pH, presence/absence of aquatic vegetation, water turbidity and type of substrate were recorded. Significant differences in sex-and age-specific prevalence rates and intensity of infection (geometric mean EPG) were tested using the Chisquare test.

RESULTS

The results of stool examination are shown in tables 1-3. A total of 960 persons were examined out of which 119 (12.4%) were diagnosed positive for S. mansoni. Infected individuals were present in 6 of the 10 localities studied. The prevalence of the disease was 40% at the Finchaa Valley Elementary School located near the Finchaa Dam outlet and 29.5% among family members of labourers of the Finchaa State Farm located some 40 km downstream from the dam (table I and fig.1). Age-and sex-specific analysis of the results is not possible (table 2 & 3) since representative samples from those catagories were not taken in the schools. Among the family members of the labourers, whose age ranged from 0 to 59 years, the prevalence was highest among the 10-14 year age group, while EPG was also highest in the same age group but only among males. Both sexes combined, the egg output turned out to be highest among the 0-4 year age group, although the prevalence was only 7/56 (13.5%). Neither prevalence nor EPG was significantly different ($p>0.01$) due to sex (table 4).

The results of malacological and ecological studies are shown in table 5. The snail intermediate host of S. mansoni, i.e, Biomphalaria pfeifferi, was collected at three sites within the valley. However, transmission was identified at only one site which is located in the lower portion of the valley.

The habitat characteristics of the snail collection sites were all within normal ranges. The banks/shores of the water bodies surveyed for snails were covered with moderate to abundant vegetation. The substrate were, in most cases, muddy and the water was moderately cool (18-200C) and adequately clear.

DISCUSSION

Schistosoma mansoni was first reported in Finchaa town by the Institute of Pathobiology in 1982. The prevalence reached 33% among the school children (13). Further epidemiological and malacological studies conducted in eight communities around the Finchaa and Amertidam sites in 1984 again revealed high prevalence of intestinal schistosomiasis among school children in Finchaa town (33%) and Lemlem Bereha (23%) (fig.1). Transmission foci were also identified at these two sites (14).

Table 1. **Results of stool examination in the Finchaa Valley (1990).**

Community examined	Study subjects	Number examined	Number (%) positive
Achane Elementary School	Students	100	0(0)
Didibie Elementary School	-	100	0(0)
Finchaa Valley Elementary School	-	100	40(0)
Finchaa Valley Junior Secondary School	-	100	3(0)
Gaba Lega Elementary School	-	100	0(0)
Homi Elementary School	-	100	0(0)
Camp 7 residents	Labourers	200	59(29.5)
Camp 8 residents	-	46	3(6.5)
Camp 9 residents	-	54	9(16.7)
Camp 10 residents	-	60	5(3)
Total		960	119 (12.4)

Table 2. **Prevalence and intensity of S. Mansoni infection among Finchaa Valley Elementary School children by age and sex (1990).**

Age group (Years)	No. examined			No.(%) positive					
	M	F	Total	M	F	Total	M	F	Total
5.9	14	15	29	8(57)	4(27)	12(41)	157	159	158
10.14	40	29	69	17(43)	10(25)	27(39)	288	162	223
15.19	2	0	2	1(50)	0(0)	1(50)	200	0	200
Total	56	44	100	26(46)	14(32)	40(40)	225	161	200

EPG-Eggs per gram of faeces

Table 3. **Prevalence and intensity of S. Mansoni infection among Finchaa Valley Junior Secondary School children by age and sex (1990).**

Age group (Years)	No. examined			No.(%) positive					
	M	F	Total	M	F	Total	M	F	Total
5.9	36	18	52	0(0)	1(6)	1(2)	0	200	200
10.14	36	7	43	0(0)	1(14)	1(2)	0	850	850
15.19	3	2	5	1(33)	0(0)	1(20)	650	0	650
Total	57	25	100	1(1)	2(8)	3(3)	650	412	489

EPG-Eggs per gram of faeces

Table4**. Prevalence and intensity of S. Mansoni among family members of the labourers (all camps combined) in Finchaa Valley by age and sex (1990).**

Age group (years)	No. examined			No.(%)Positive			EPG		
	M	F	Total	M	F	Total	M	F	Total
0.4	38	22	60	5(13)	2 (9)	7(12)	304	229	330
5.9	58	38	96	21(36)	11(24)	32(33)	145	323	191
10.14	27	21	48	12(44)	11(52)	23(48)	432	137	191
15.19	2	6	8	1(50)	1(17)	2(25)	50	250	112
20.24	0	9	9	0(0)	0(0)	0(0)	0	0	0

25.29	7	18	25	1(14)	1(6)	2(8)	50	50	50
30.34	16	18	34	3(18)	2(11)	5(15)	234	71	145
35.39	15	10	25	1(7)	0(0)	1(4)	50	0	50
40.44	22	10	32	4(18)	0(0)	4(13)	130	0	130
45.49	11	1	12	1(9)	0(0)	1(8)	50	0	50
50.54	4	1	5	0(0)	0(0)	0(0)	0	0	0
55+	3	0	3	1(33)	0(0)	1(33)	150	0	150
Total	100	155	357	50(25)	28(18)	78(22)	207	187	199

Table 5**. Results of snail survey in the Finchaa Valley (1990).**

Name of Community	Type of water body	Altituds (m)	pH	Turbidity (^{0}c)	Turbidity	Snail Species [1]
Finchaa Town	Dam (washing site)	2260	7.0	19	Clear	1
Amerti	Stagnant	2240	7.0	18	Clear	0
Gaba Lega	Stream	2230	7.0	20	Moderate	0
Fikre [2]	Stream near camp 6	1600	7.0	18	Clear	1,2,3
Fikre	Stream near camp 7	1600	7.0	18	Clear	1
Lemlem Valley	Stream	1600	7.0	20	Clear	0

1 0-No snail, 1-Biomphalaria pfeifferi (9)147 infected), 2- Bulinus species, 3- Gyraulus species,
2 Transmission site identified

The present study has covered, in addition to the previous sites, more camps and residents in the Lemlem Bereha where settlement and a State Farm have been in progress since the 1980s. High human infection rates were found among the farm labourers in the valley reaching 22 % (table 4). Finding of human infection among farm labourers and identification of a transmission focus (table 5) obviously indicate that the transmission of S. mansoni is well established in the Lemlem Bereha which forms the lower portion of the Finchaa Valley (fig.1). On the other hand, except the Finchaa town where the human infection rate reached 40% among the school children, communities located in the upper portion of the valley seem to be safe and
there appears to be no authochtonous S. mansoni transmission. This may show that the two dams (the Finchaa Hydroelectric and the Amerti dams) are not yet important media for human water contact activities. Lack or scarcity of vector snails along the edges of these water bodies, except at a smaller water pool formed by out going water from the Finchaa Hydroelectric dam (fig.1) is additional evidence that S. mansoni is not well established around the dam sites yet. The pool formed by excess water flowing out of the Finchaa Dam is an extremely important human water contact point where all sorts of activities including laundering, bathing, water collection and fording are taking place. Focal snail control at this point should significantly
reduce the risk of infection for the children.

Water impoundment, resettlement and agricultural activities have been in progress since the 1970s in the Finchaa Valley (11). It is difficult to conclude if the disease had been there before the construction of the hydroelectric dam in 1972 or if it was newly introduced as a result of the development activities, since there are no pre-construction health data against which the present status of schistosomiasis in the valley can be compared. In the lower portion of the valley, re-settlement of people who originated from northern Ethiopia, especially from Tigray and Wello where intestinal schistosomiasis is endemic, may explain why the disease has become more prevalent. It is of interest to find quite a high prevalence and intensity of infection among the very young (0-4 years of age). Perhaps the mothers are using the infected water to bath their young children. This warrants provision of a safe water supply for the farm camps. Such provision will not only contribute to schistosomiasis control in the long run, but will also have multiple benefits in the reduction

of infestation with polyparasitism and diarrhoeal diseases.

The construction of irrigation schemes in Africa has led to increased transmission of schistosomiasis in the area due to the ideal transmission conditions present in irrigation canals (15). Rapid increase in schistosome
transmission has been well documented in countries such as Egypt, Ghana, Ivory Cost, Mali and the Sudan in association with water development projects (16). In Ethiopia, successive governments have been giving high priority to the development of irrigated agriculture and the construction of dams for hydroelectric power production. However, most water development schemes were located without prior assessment of the risk of schistosomiasis and other water-related diseases (17). There is adequate evidence to show that schistosomiasis has increased in prevalence, intensity of infection and distribution in association with increase in water impoundment and irrigation schemes in this country (1,2,4). For instance, the development
of water resource in the Awash Valley of Ethiopia has led to the spread of schistosomiasis in the area (2,4,18). From only a rare disease (less than 2%) in the early 1960s in Wonji and Metehara sugar estates, intestinal schistosomiasis has increased drastically, the prevalence reaching 80% among school children in Wonji (15) and more than 60% in some plantation camps of the Metehara irrigation scheme (14). The disease has also been reported from other actual and/or potential water development projects such as the Baro Basin (8), Beles Valley (7), and Omo Valley (10). The aCtual and/or potential health implications of these developments with emphasis on schistosomiasis has been assessed by Kloos (4).

At the moment, the government is undertaking the development of irrigated agriculture for sugar cane production at the cost of close to 300 million USD in the Finchaa valley. When completed, it is expected that the Finchaa Sugar Project will ultimately create jobs for over 7,000 workers who will in turn create a population that may surpass 25,000 people in the project area (11). Such an agglomeration of human subjects
in the presence of perennially ubiquitous fresh water bodies may bring about a major contamination leading to a more widespread and intensive transmission of schistosomiasis and other vector-borne diseases in the area. This will happen if appropriate irrigation design and disease preventive measures are not incorporated
into the project at the initial stage. Biomphalaria pfei.tferi, the snail intermediate host of Schistosoma mansoni in the area, seem to be flourishing particularly in the lower portion of the valley. With the creation of an extensive open canal system irrigating some 10,000 ha of land even more favourable snail breeding and s. mansoni transmission habitats may be created.

Apparently there is no urinary schistosomiasis in the area. However, the low altitude coupled with the presence of Bulinus truncatus (table 5), a snail intermediate host of S. haematobium in a number of African countries, may pose potential threat. Human travel activities may bring about the introduction of B. trunctus transmitted strains of S. haemarobium from neighbouring countries such as the Sudan where B. trancatusborne S. haematobium is endemic (19). Hence, the future arrival and settlement of individuals without screening and treatment of positive cases raise serous concern in terms of introducing new strains of the parasite into this ecologically receptive area.

ACKNOWLEDGEMENT

The expense was covered by financial assistance made available from the Research and Publication Office (RPO) of Addis Ababa University. We thank Messrs. Tadesse Chane, Abraham Redda and Negash Gemeda for their .technical assistance.

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