

The Prevalence of Bilharziasis in European Schoolboys at Salisbury, Rhodesia

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INTRODUCTION

Many of the earlier surveys on the prevalence of bilharziasis in European school children in Rhodesia were restricted to the examination of urine specimens for schistosome eggs because, despite subsequent evidence to the contrary, prior to the Second World War *Schistosoma mansoni* infections were not considered to be a big problem in the European population. However, two earlier surveys included the examination of specimens of both stool and urine from each subject. Bennie and Blair (1955) record that in 1938, 953 children in the Salisbury and Gwelo areas were examined; of these, 64 showed urinary infections with *S. haematobium* and 38 showed stool infections with *S. mansoni*. This represents infection rates of 6.7 and 4.0 per cent. respectively. In the same year 223 boys of Plumtree School, aged 11 to 18 years, were examined; 14 were passing *S. haematobium* eggs in the urine and six were passing *S. mansoni* eggs in the stool. Two boys had double infections. This represents a total bilharziasis prevalence rate of 9.9 per cent. Baker-Jones and Blair, who carried out the study, noted that there was no significant difference in the prevalence rates in the three age categories into which the boys were grouped.

Loveridge, Ross and Blair (1948) attempted to study the effect of bilharziasis on educational attainment in European and African boys attending schools in Salisbury. At that stage schools offering academic education were separated from other schools offering "modern" education designed to prepare the boys for technical or artisan training. In this survey two schools for European boys were studied. The first, Prince Edward School, was of the academic type, and the other, Allan Wilson School, offered the modern course. They found an overall bilharziasis pre-

valence rate, based on urine and stool examinations, of 9/108 (8.3 per cent.) at Prince Edward School and 27/91 (29.7 per cent.) at Allan Wilson School. They concluded that a bilharziasis infection may affect a person's chances of achieving a scholastic standard acceptable for entry to a course of academic secondary education.

PREVALENCE SURVEY, 1965

In the period May to July, 1965, a bilharziasis survey of four secondary schools for boys in Salisbury was undertaken and an effort made to obtain specimens of stool and urine from all the pupils. The schools in question were visited and urine specimens were obtained from each boy, the subject being asked to pass the last portion of urine expressed by muscular action from the bladder into the wide-mouthed container provided. It was found to be impractical to attempt to obtain the urine specimens at the optimum time for egg production, which is from noon to 2 p.m.; however, since all specimens were collected between 9 a.m. and noon it was felt that the results are sufficiently comparable. At the same time that urine specimens were handed in, each boy was given a screw-capped bottle containing 20 to 30 ml. of a 10 per cent. formalin solution in water to which had been added a small quantity of detergent, and a wooden spatula-spoon was supplied for picking up the portion of stool. Careful instructions were given to each class in turn on how to obtain the stool specimen without contamination with urine or water. These stool specimens were collected at the school on the following day, although it was necessary to revisit the schools on several occasions subsequently to urge the submission of stool specimens from certain of the boys. The age of each boy was recorded.

In the four schools 1,732 boys, all aged from 12 to 19 years old, provided specimens of urine and stool for examination. In addition to this, a further 121 boys submitted specimens of urine only; of those, eight (6.6 per cent.) showed infections with *S. haematobium*, and 12 submitted specimens of stool only; two of these showed *S. mansoni* infections.

The overall bilharziasis prevalence, including infections with *S. mattheei* and the presence of eggs in either stool or urine of all three species, are set out in Table I. Because of the limited attention paid to *S. mansoni* infections in Europeans in the past, Table I gives the specific prevalence rates of this species. This table also sets out the results as between boarders and day

Table I

Schools	Number of Boys Examined	Total Bilharziasis Infections		<i>S. mansoni</i> Infections	
		Number	Per cent.	Number	Per cent.
1	596	78	13.1	33	5.5
2	374	37	9.9	14	3.7
3	378	20	5.3	12	3.2
4	384	29	7.5	10	2.6
TOTAL	1,732	164	9.5	69	3.9
School boarders	158	21	13.3	9	5.7
Day boys	1,574	143	9.1	60	3.8
TOTAL	1,732	164	9.5	69	3.9

boys, as the former group who have their homes in rural areas must be expected to have greater exposure to infection.

The overall prevalence of *S. haematobium* is 108/1732 (6.2 per cent.), for *S. mansoni* 67/1732 (3.9 per cent.), and for *S. mattheei* 7/1732 (0.4 per cent.).

Blair (1965) reported on anomalous portals of exit of schistosome eggs in Africans infected with one or more of these three species. It is interesting to note that in these European school boys similar cases of anomalous portals of exit were observed in the following instances:

<i>S. mattheei</i> eggs in stool	4
<i>S. haematobium</i> eggs in stool	2
<i>S. mansoni</i> eggs in urine	2
<i>S. haematobium</i> and <i>S. mansoni</i> eggs in urine	1
<i>S. haematobium</i> and <i>S. mansoni</i> eggs in stool	1
<i>S. haematobium</i> and <i>S. mattheei</i> eggs in urine	1
<i>S. haematobium</i> and <i>S. mattheei</i> eggs in stool	1

S. haematobium and *S. mansoni* eggs in urine 1
S. haematobium and *S. mattheei* eggs in stool 1
S. haematobium, *S. mansoni* and *S. mattheei* eggs in urine 1
 giving a total of 13 cases.

AGE PREVALENCE

The age prevalence relationship, considering all four schools together, is set out in Table II.

Despite the fact that no infections were observed in 22 boys who entered high school at the age of 12 years, it is clear that at 13 years, when most boys move to high school, a number already have established infections. However, the results do not show the definite age prevalence pattern which is observed so often in African communities. This lack of a pattern of prevalence in relation to age is probably the result of treatment given to European children because of greater parental awareness of the disease.

Table II

AGE PREVALENCE OF BILHARZIASIS

Age in Years	Number Examined	Total Bilharziasis Infections		<i>S. mansoni</i> Infections	
		Number	Per cent.	Number	Per cent.
12	22	0	0.0	0	0.0
13	296	33	11.1	12	4.0
14	355	31	8.7	12	3.5
15	321	36	11.2	16	5.0
16	354	27	7.6	13	3.6
17	242	22	9.1	11	4.5
18	125	12	9.6	3	2.4
19-20	17	3	—	2	—
	1,732	164	9.5	69	4.0

BILHARZIASIS AND EDUCATIONAL ATTAINMENT

Loveridge, Ross and Blair (*op. cit.*) indicated that bilharziasis might affect the standards of educational attainment by European school children, although for some reason not fully understood this factor was not apparent in the cases of African children infected with the disease. Table III shows the relationship of prevalence of bilharziasis with educational attainments in class rating in the four senior schools examined. In this table the lower forms of high school are considered apart from the forms of the upper school.

In Rhodesia the first four years of high school lead to the examinations for the "O" Level of the General Certificate of Education. The boys who are in the fast streams have their educational programme geared to this time-table. Boys in the slow stream are not expected to complete the programme in four years and are allowed an extra year for this purpose. In the upper high schools there are generally two streams—one academic, in which pupils are working either for the "M" Level (one year) or "A" Level (two years) of the General Certificate of Education in order to obtain entrance qualifications to South African or British universities respectively. The other stream consists of boys who have passed some of their examinations at "O" Level, but who are endeavouring to get further or better passes in specific subjects. Since com-

pulsory education for European children extends to the age of 16 years, this group might also include some boys who have not yet reached that age and who therefore have to persist at school for a longer period. Table III shows that there appears to be a definite relationship between prevalence of bilharziasis, and particularly of infections with *S. mansoni*, and the educational stream in which the boy is placed. What remains to be answered is the question of whether a boy is in a slower stream because he is suffering from bilharziasis or whether boys whose innate intelligence equips them only for the slow streams are more likely to expose themselves to the risk of bilharziasis in their out-of-school activities. There are a number of points which might be of interest in the elucidation of the question. There are a total of six sets of brothers who were found to be suffering from bilharziasis. In five of these sets of brothers there was only one, or at the most two, years' difference in age and one would expect the brothers to play together and share their outdoor activities, thus having the same opportunities to contract bilharziasis. In fact, all 12 boys of the six sets of brothers showed active infections. At one school there is a high proportion of the boys who are Jews, but not a single boy of this faith was found to be suffering from bilharziasis. The headmaster of one of the schools made an interesting observation. He noted that all the boys at his school who showed infections of

Table III

PREVALENCE OF BILHARZIASIS IN RELATION TO EDUCATIONAL ATTAINMENT
IN FOUR HIGH SCHOOLS

Education Stream	Number of Pupils Examined	Total Bilharziasis Infection		<i>S. mansoni</i> Infection	
		Number	Per cent.	Number	Per cent.
1. Forms I-IV (Lower High School)—					
"A" stream	421	20	4.7	7	1.6
"B" stream	394	34	8.6	13	3.3
"C" stream	369	41	11.1	20	5.4
"D" and lower streams	279	50	17.9	22	7.9
TOTAL LOWER FORMS	1,463	145	9.9	62	4.2
2. Above Form IV (Upper High School)—					
Potential university material	181	11	6.1	2	1.1
Others	88	8	10.0	5	5.7
TOTAL HIGHER FORMS	269	19	7.1	7	2.6
GRAND TOTAL	1,732	164	9.5	69	4.0

S. mansoni lived north of the main thoroughfare bordering the school grounds; this thoroughfare divided into nearly equal parts the area from which the boys attending the school are drawn. He went further and indicated that the high ratio of *S. mansoni* infection in the boys from the northern parts could be attributed to a river running through that area and a disused quarry, both of which were frequented by boys of this area during school vacations.

A rather surprising fact was that despite the intense interest of the European community in the disease, and particularly as affecting the health of their children, a number of boys found infected in the present survey were reported to the parents as infected in school medical inspection surveys carried out in 1964. Despite being told of the presence of infection a year ago, some of the boys were still untreated a year later.

DISCUSSION

The 1965 survey indicates a lessened overall bilharziasis prevalence in teenage European schoolboys in Salisbury as compared with a restricted survey carried out in 1947, when the overall prevalence was 18 per cent. There are, however, indications that the *S. mansoni* prevalence has increased since the survey of 1948, although, because of improvements in techniques for processing stools, it is difficult to be dogmatic on this point.

The distinct pattern of age prevalence so clearly seen in African children of the same age groups was not observed. No doubt the age prevalence in European schoolboys is very much affected by treatment given for the disease at all stages of the school-going period.

A definite and distinct association was observed between the prevalence of bilharziasis, and particularly of *S. mansoni* infections, and intellectual ability of the boys, as indicated by class and "stream" positioning. There are two possible explanations for this association. On the one hand the infections, particularly if they are long standing, may prevent the children from attaining their full educational potential. On the other hand, boys whose limited inherent ability makes them less likely to pursue academic activities out of school hours possibly place more emphasis on outdoor activities, and they may therefore suffer greater exposure to infection.

The authors consider that both factors may operate simultaneously and that bilharziasis must have a deleterious effect on the full development of a child's mental and intellectual capacity.

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