

The risk of schistosomiasis in Zimbabwean triathletes

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A study was carried out to determine the risk of schistosomiasis in triathletes in Zimbabwe. The prevalence of schistosomiasis in 30 triathletes (24 males, 6 females) was compared with that in 24 non-triathlete controls after the 1989/90 triathlon season. All the subjects found to be infected were then treated with praziquantel (40 mg/kg). The seasonal incidence of schistosomiasis in triathletes was then determined in a prospective study during the 1990/91 season. Schistosomiasis was diagnosed by urine and stool microscopy for ova, blood eosinophil counts and serological bilharzial fluorescent antibody tests for IgM and IgG antibodies. There was a significantly ($P < 0,05$) higher prevalence of schistosomiasis among the triathletes (80%) than among the controls (38%). The seasonal incidence of schistosomiasis was 64%. Exposure of triathletes to fresh-water dam swimming in Zimbabwe poses a significant risk for the development of schistosomiasis.

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In recent years the sport of triathlon (cycling, swimming and running) in Zimbabwe has been characterised by an increasing number of local and overseas competitors who enter the major standard-distance triathlon events on the national race calendar. In the 1989/90 season (October-April) the 1,5 km swim legs of some of the major triathlon events in Zimbabwe were moved away from chlorinated

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swimming pools to open bodies of fresh water, to accommodate the increased number of entries. During the 1989/90 season these swimming events took place in one water-filled quarry (October 1989), and four fresh-water dams (December 1989 and January, March and April 1990), and in the 1990/1991 season in the same mine quarry, (October 1990) and two fresh-water dams (December 1990, March 1991).

Reports from the local water authorities indicated that the fresh-water dams were known to be potential sources of schistosomiasis (bilharzia) because: (i) they were located in areas where schistosomiasis is endemic; and (ii) they were shown to contain the fresh-water snail species that form the intermediate host for *Schistosoma mansoni* and *S. haematobium*.¹ The mine quarry did not have any snail host species.

Humans may become infected with schistosomiasis by bathing, wading or immersing limbs in infested fresh water. The risk is increased if the water is slow-flowing, still or shallow.²⁻⁴ The severity of human infection is related to the frequency and duration of such water contact.⁵⁻⁷ The potential acute and long-term effects of schistosomiasis in humans^{2,8-12} were of concern to the race organisers. In particular, overseas athletes who have never been exposed to schistosomiasis were potentially at increased risk.^{4,13} It is important to note that physically active Zimbabweans commonly have contact with fresh water through other water-based recreational pursuits such as boating, angling, windsurfing and water-skiing.

Specific precautions to decrease the risk of infection to competitors were taken by the organisers of triathlon events in Zimbabwe during the 1989/90 season. These consisted of spraying molluscicide at the swim entry and exit points, and confining the swim routes to relatively deep water. Despite these precautions, cases of schistosomiasis were recorded in triathletes during and after the 1989/90 season. However, the extent of the problem was not documented.

The aims of this study were: (i) to document the prevalence of schistosomiasis in the triathletes who participated in the 1989/90 season; and (ii) to determine the incidence of schistosomiasis in triathletes competing in fresh-water swims during the 1990/91 season.

Methods

A sample of 30 triathletes (24 males, 6 females) was randomly selected from those who had competed in all the open fresh-water swims during the 1989/90 national Zimbabwean triathlon season. A control group of 24 runners (20 males, 4 females) who did not participate in triathlons was randomly selected from members of a running club in Harare. All the subjects were asked to complete a questionnaire enquiring about other recreational activities in fresh water, and whether they had recently (in the previous 4 months) been tested or treated for schistosomiasis. All the subjects gave written informed consent to be tested for schistosomiasis, and, if found to be positive, to be treated.

Six triathletes and 3 runners had been tested (in the previous 4 months) and the results of these tests were available. The remaining 24 triathletes and 21 runners in the control group underwent laboratory testing for

schistosomiasis. The laboratory tests were conducted by medical technologists at a private medical laboratory in Harare. Blood samples, a midday urine specimen and a stool specimen were taken from each of the subjects. A serum bilharzia fluorescent antibody test (BFAT) for IgM and IgG antibodies and a blood film eosinophil count were performed. Microscopy for the detection of schistosoma ova was conducted on the urine and stool specimens. The criteria used in this study to diagnose schistosomiasis infection are listed in Table I.¹⁴ The prevalence of schistosomiasis in each group before the 1990/91 season was taken as the percentage of subjects who tested positive for schistosomiasis in each group.

Table I. Criteria for the diagnosis of schistosomiasis

One or more of the following constituted a positive diagnosis:

- Positive BFAT for IgM antibodies
- Schistosoma ova* detected in urine
- Schistosoma ova* detected in stool
- Positive BFAT for IgG antibodies (negative IgM) plus eosinophilia > 6%

The same sample of triathletes was studied over the 1990/91 triathlon season to determine the seasonal incidence of schistosomiasis in Zimbabwean triathletes. To establish a baseline whereby the triathletes would be free of schistosomiasis at the start of the 1990/91 season, triathletes who had tested positive (and had not already been treated) were given a single oral dose (40 mg/kg) of praziquantel 5 months before the start of the season. It has been well documented that praziquantel is very effective in the treatment of schistosomiasis in man.¹⁵⁻¹⁷ In the absence of re-infection no ova can be detected in urine or stool, the eosinophil count drops to < 6%, and BFAT (IgM) tests become negative within 6 months of therapy.¹⁴

Five months after treatment had been given to these athletes and before the first open-water dam swim of the 1990/91 season, all 30 triathletes were again tested to ensure that they were negative for schistosomiasis, using the following criteria: (i) negative BFAT for IgM antibodies; (ii) no ova detected in urine or stool; and (iii) negative BFAT for IgG antibodies, or positive BFAT for IgG antibodies but no eosinophilia (defined as an eosinophil count of < 6%). Three triathletes did not test negative and were therefore excluded from the incidence study, leaving 27 who were followed up during the 1990/91 season.

These subjects were asked not to engage in any fresh-water contact other than designated open-water swims of the 1990/91 triathlon season, until the completion of the study. They were also requested to report any accidental contact with possible infested fresh water. Two subjects reported fresh-water contact other than the dam swims during the triathlon season, and were excluded from the study. The final group of triathletes in the incidence study was therefore 25.

At the end of the 1990/91 season (June 1991), the 25 triathletes in the incidence study group were tested for schistosomiasis (Table I). The seasonal incidence of schistosomiasis was determined as the number of new cases of schistosomiasis in the test group during the season.

Statistical analysis

The pre-season prevalence of schistosomiasis in the triathlete group and the control group was compared using the chi-square test. The level of statistical significance was established at $P < 0,05$.

Results

The results of the laboratory tests for schistosomiasis over the study period in the triathletes and controls are set out in Table II.

Table II. Results of laboratory tests for schistosomiasis in the triathletes and controls

	Triathletes (N = 30), July 1990	Runners (N = 24), July 1990	Triathletes (N = 30), Dec 1990	Triathletes (N = 25), July 1991
BFAT IgM +ve	21	8	2	15
BFAT IgG +ve and eosinophilia > 6%	3	1	1	1
Ova in stool	1	1	0	0
Ova in urine	0	0	0	0

The prevalence of schistosomiasis before the onset of the 1990/91 season in the triathletes (80%) was significantly higher ($P < 0,05$) than that in the runner controls (38%).

There was no significant difference ($P > 0,05$) in reported recreational fresh-water contact during the 1989/90 season between the triathletes (85%) and the control runners (80%). The seasonal incidence of schistosomiasis in the triathletes was 64%.

Discussion

The results of this study show that triathletes in Zimbabwe who swim in the open fresh-water dams have a significant risk of contracting schistosomiasis during the season. The high prevalence rate we documented in triathletes after the 1989/90 season (80%) is probably related to the infection risk posed by: (i) the extra two dam swims during that season; and (ii) the high frequency of reported recreational fresh-water contact.

The prevalence of schistosomiasis in these triathletes is much higher than that reported in canoeists after the 1988 and 1989 Duzi canoe marathons in Natal.¹⁸ The possible reasons for this are: (i) canoeists (unlike triathletes) do not immerse their whole bodies in the water for any length of time and are therefore not exposed to infested water to the same degree as the triathletes in our study; (ii) the Duzi is a fast-flowing river and is located in a different geographical area; and (iii) because only urine testing for ova was conducted in the study on canoeists, significant under-reporting of schistosomiasis could have taken place. The prevalence of schistosomiasis in triathletes in our study is similar to that reported in schoolchildren in Zimbabwe (consistently above 60%¹⁹).

In our study urine and stool microscopy for the detection of ova produced a very low yield in relation to the number of

positive serological (BFAT) tests. This suggests either very low levels of infection (low worm loads or single-sex infections) or a degree of false-positive detection by serological tests. Finally, the reason why 3 triathletes had a positive BFAT 5 months after treatment may have been contact with infested fresh water after the date of treatment, or that insufficient time had elapsed for their antibody titres to drop.

In summary, the high seasonal incidence (64%) of schistosomiasis in triathletes during the 1990/91 season indicates that the precautions taken by race organisers of triathlons in Zimbabwe were not effective. We suggest that these measures be reviewed and that triathlon swims be moved to open fresh-water sources that are not infested with schistosomiasis. These recommendations should also be considered in other areas where schistosomiasis is endemic.

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