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REFERENCES

1. Geary CG. *Aplastic anaemia*. 1st ed. London: Baillière Tindall Cassell, 1979: 43.
2. Camitta BM, Storb R, Thomas ED. Aplastic anaemia. *N Eng J Med* 1982; 306: 645-52, 712-18.
3. Mir MA, Geary CG. Aplastic anaemia: An analysis of 174 patients. *Postgrad Med J* 1980: 56: 322-9.
4. Williams DM, Lynch RE, Cartwright GE. Drug induced aplastic anaemia. *Sem Haematol* 1973; 10: 195-223.
5. Mohler DN, Leavell BS. Aplastic anaemia: An analysis of 50 cases. *Ann Intern Med* 1958; 49: 326-62.
6. Esan GJF. Aplastic anaemia in Nigerians. *West Afr Med J* 1973; 22: S34-S40.
7. Mabin TA, Gelfand M. Aplastic anaemia in Africans. *Trop Geogr Med* 1974; 26: 423-4.
8. Mukiibi JM. Severe aplastic anaemia in Kenyans. *East Afr Med J* 1981; 58: 752-68.
9. Fleming AF. Hypoplastic anaemia in pregnancy. *J Obstet Gynaecol Br Cwlth* 1968; 75: 138-41.
10. Esan GJF. Chloramphenicol induced aplastic anaemia in Nigerians. *Nigerian Med J* 1974: 4: 115-17.
11. Guillozet N, Mbantankhu JF. Congenital hypoplastic red cell anaemia of childhood: The Blackfan-Diamond syndrome; case report, diagnosis and management. *East Afr Med J* 1977; 54: 345-52.
12. Lowenthal MN, Jones IG, Desai M. Aplastic anaemia and optic fundus haemorrhages due to traditional herbal remedies. *J Trop Med Hyg* 1978; 81: 177-9.
13. Dacie JV, Lewis SM. *Practical haematology*. 6th ed. London: J and A Churchill, 1984.
14. Camitta BM, Thomas ED, Nathan DG *et al*. Severe aplastic anaemia: A prospective study of the effect of early marrow transplantation on acute mortality. *Blood* 1976; 48: 63-70.
15. Camitta BM, Thomas ED, Nathan DG *et al*. A prospective study of androgens and bone marrow transplantation for treatment of severe aplastic anaemia. *Blood* 1979; 53: 504-14.
16. Hillman RS, Finch CA. The misused reticulocyte. *Br J Haematol* 1969; 17: 313-15.
17. Fleming AF. Hypoplastic anaemia in pregnancy. In: Jones NCN. ed. *Clinics in haematology*. London: WB Saunders, 1973: 447-96.

Seasonal Patterns in Water Contact and the Influence of Water Availability on Contact Activities in Two Schistosomiasis- Endemic Areas in Zimbabwe

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SUMMARY

Studies of human water contact patterns and the possible factors that affect contact were carried out by direct observation of human contact activities at twelve sites located in streams in the highveld region of Zimbabwe over a 27-month period during 1982-4. The results showed that water availability was the main factor affecting contact at sites that dried, or experienced marked reductions in water levels during parts of the year. As a result, there was a great decrease in contact at these sites during the second year of study when levels of water in the streams were severly reduced owing to poor rains and this, to an extent, may account for a noticeable decline in incidence of schistosomiasis in children living in the areas from the first year to the second year of study. At the permanent sites availability of water was not a limiting factor and some seasons showed distinct patterns in contact. Contact at these sites was intense in the hot, dry season (September-November) but markedly reduced in the cool, dry season (June-August) and these differences are attributable to the effect of temperature. Contact in the rainy season (December-February) and warm, post-rainy season (March-May) showed no particular trend, although at this time of the year agricultural activities may have some effect on contact. The practical importance of these observations as regards control by reduction of contact is briefly discussed.

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INTRODUCTION

Human water contact with cercariae-infested water is a prerequisite for the transmission of schistosomiasis. Thus, studies of human water contact activities in natural water are important in elucidating the major activities involved,[1,2] the relative risk of exposure by the different age and sex groups[3] and the role of contaminatory water contact activities in transmission of schistosome eggs.[4] From these studies,[1-3] it is clear that the water contact requirements of the sex/age groups are different and specific for the needs of each particular group and these aspects must be borne in mind in the provision of piped/borehole water sources to reduce contact with natural water.

The emergence pattern of cercariae of the human schistosomes from infected snails is diurnal with peak cercarial densities being obtained between 1100 h and 1500 h,[5,6] the hottest period of the day, which often coincides with the highest human water contact.[1,7] There are also seasonal variations in the risk of transmission of schistosomiasis, and in Zimbabwe transmission is greatest in the hot, dry months of the year (September-November) and lowest in the cool, dry months (June-August) and rainfall and temperature are the main factors that influence these transmission patterns.[8,9] From these observations it is clear that the transmission pattern in an endemic area depends to a large extent on the seasonal variations in contact and the factors that determine these variations. Therefore, it was decided to examine seasonal variations in contact at 12 sites located in streams in two areas on the highveld region of Zimbabwe where prevalence of urinary schistosomiasis (*Schistosoma haematobium*) exceeds 50 per cent and that of intestinal schistosomiasis (*S. mansoni*) is below 20 per cent. An attempt will be made to relate these seasonal variations in contact to the transmission of schistosomiasis in the two areas.

MATERIALS AND METHODS

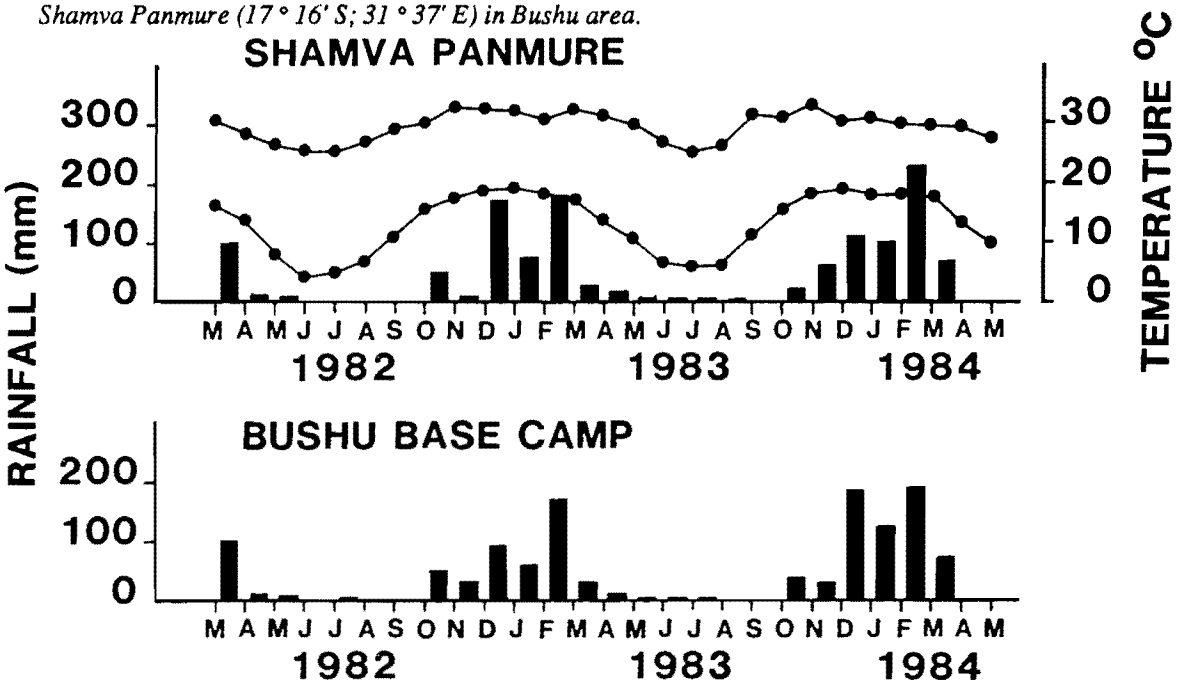
Study areas

Bushu (17 ° 15' S; 31 ° 35' E) and Chiweshe (17 ° S; 31 ° 10' E) are communal areas situated at an altitude of approximately 1 500 m above sea level on the highveld region of Zimbabwe inhabited by the Shona ethnic group. The Shona are mainly peasant farmers living in small villages, a number of which form a ward which is represented by a councillor on a district committee. However, traditional authority rests with the chiefs and village elders who are the cultural heads of their communities. Approval for the study was sought from traditional and political leaders to whom the purpose of the study was explained in full. Culturally, it would have been inappropriate to seek individual permission as a decision to allow the study to go ahead is of the type made on a community basis.

Approximately 2 000 people living in seven villages in the study areas had all or a significant proportion of their water contact activities at one or more of the twelve main contact sites in the study areas, as piped/borehole water supplies are inadequate. Water contact was necessitated by domestic, recreational and agricultural activities. There are distinct rainy (November-March) and dry (April-October) seasons in the study areas. Marked fluctuations in temperature and rainfall are experienced in the areas as exemplified by data from Bushu and Panmure weather stations in Bushu area (Fig.1). There are four well-defined seasons in the highveld region namely, cool, dry (June-August), hot, dry (September-November), rainy (December-February) and warm, post-rainy (March-May) season.[4] Agricultural activities are intense in the rainy reason but people have more leisure time in the post-rainy season as they wait for the crops to dry before harvesting.

Twelve intensively used human water contact sites, numbered B1 to B6 in Bushu and C1 to C6 in Chiweshe, were selected for the study. Two of the Bushu sites (B2 and B4) were dry from December 1983 to February 1984, five sites (B1, B3, C4, C5 and C6) experienced marked reductions in water levels during parts of the year, whereas five sites (B5, B6, C1, C2 and C3) experienced a less marked seasonality in water flow. None of the sites experienced major flooding conditions during the period of observation which is unusual for the area and is attributable to poor rains during the study.[4] From these observations it was decided to categorize the waterbodies into temporary (B2 and B4), intermediate (B1, B3, C4, C5 and C6) and permanent (B5, B6, C1, C2 and C3) sites.

FIGURE 1 - *Patterns of monthly rainfall (mm) at Bushu Base Camp (17 ° 11 S; 31 ° 37' E) and monthly rainfall (mm) and temperature (mean of maximum and minimum air temperatures, °C) recorded at Shamva Panmure (17 ° 16' S; 31 ° 37' E) in Bushu area.*



Water contact observations

Water contact activities were observed at the sites over the 27-month study period (March 1982 to May 1984) for five days each month from 0700 h to 1100 h and from 1200 h to 1700 h. This arrangement was required since the persons employed to do the observations were government employees with no overtime benefits. As a result, the observations were not exhaustive. Nevertheless, they are considered to be representative of the day-time activities and night time is probably of no importance as people in the areas studied do not normally use the sites at night for any activity. Each observer was assigned to two sites in each study area for observation on alternate days, except for the period from December 1983 to February 1984 when sites B5 and B6 (permanent waterbodies) were observed daily for ten consecutive days in a month, as the alternate sites, B2 and B4, were dry.

For convenience, the type of activities were recorded in numerical form to represent the type of contact as follows: 1 = crossing/collecting/washing the extremities; 2 = washing clothes/utensils; and 3 = bathing/swimming/playing in water. The sex and times of entry and exit from the water were also recorded.

Parasitological examination

A total of 487 children (6-11 years old) attending Chishapa and Bushu schools in Bushu area and Nzvimbo and Kakora schools in Chiweshe area were selected for the incidence study. Faecal and urine samples were examined for two study periods, the first from July 1982 to March 1983 and the second from March 1983 to March 1984. Incidence was extrapolated to a 365-day interval in each period of study.

Diagnosis of infection was based on single sample detection of eggs of *S. haematobium* in urine and those of *S. mansoni* in faeces using the sedimentation-centrifugation technique and supplemented by the miracidial hatching technique.[11] Sedimentation-centrifugation and hatching are qualitative techniques and in this study the whole of the urine sample and about five grams of the faecal sample were examined, large enough samples to have increased the diagnostic sensitivity of the techniques.

Data presentation

For brevity, seasonal variations in water contact are provided for only five sites (B3, B4, B5, C1 and C4) out of the twelve studied. These five sites are considered to be representative of the three types of water bodies examined (i.e. temporary, intermediate and permanent) in the two study areas.

Frequency (number of contacts) and duration (contact time in minutes) are presented as units per hour of observation. Per cent annual incidence (I) is calculated thus: $\% I = 100 (1 - x)^{365/y}$ where x is the proportion remaining negative for y days, the actual time interval between two examinations and multiplying by 100 gives the percentage value. In practice, incidence is not uniform over a given time interval and extrapolation of the results may in some cases result in unusual incidence values in excess of 100 per cent.

RESULTS

Water contact activities

The relative popularity and the type of activity at each of the twelve sites observed is shown (Table I). The frequency and duration of contacts varied markedly with site and also according to the major type of activity at the site. Further, sites could be classified as male (B2, B3, C2 and C5) or female (B1, B4, B5, B6, C1, C3 and C6) according to usage (Table I). Site C4 was used by males and females in about equal proportions. Crossing, collecting and washing the extremities involved limited exposure to water and contact time was about three minutes. The most common activities were washing clothes and utensils, the duration of contact lasting about half-an-hour and these activities were mainly done by women. Bathing and swimming normally took 25 minutes and were mainly done by males.

Seasonal patterns

Observations on human water contact at the three categories of sites (temporary, intermediate and permanent) showed that frequency and duration of contact were principally related to water availability and also temperature. In general, the frequency of contacts fluctuated in the same way as that of duration of contacts at the sites (Figs. 2, 3). No contact was possible at the temporary sites (B2 and B4) for some period of the year as the sites were dry (Fig. 2). There was a marked reduction in contact at the intermediate sites in Bushu (B1 and B3) from June 1983 to December 1983 (Fig. 2) owing to inadequate water in the sites and generally the little water that was available was polluted with soap

TABLE I - *Results of routine observations for a 27-month period showing various type of human water-contacts at different sites and their classification according to sex*

Site	Observation period (hr)	No. of contacts per hour			Mean duration of contacts (min)			Sex classification of sites
		1	2	3	1	2	3	
B1	1 082,2	0,3	1.2	0,2	4,4	44,1	26,1	Female
B2	829,5	0,001	0,1	0,5	2,4	50,0	23,5	Male
B3	948,5	0,02	0,10	0,8	6,8	48,8	27,0	Male
B4	690,0	0,01	0,19	0,2	12,8	47,3	24,8	Female
B5	1 215,8	0,07	1,3	0,9	4,6	53,1	29,9	Female
B6	1 207,3	0,1	1,0	0,5	1,1	60,3	25,3	Female
C1	1 089,1	0,6	1,3	0,8	3,0	49,3	25,4	Female
C2	1 131,8	0,05	0,3	1,1	5,6	49,7	25,3	Male
C3	1 131,8	2,4	1,3	0,2	3,4	31,7	15,2	Female
C4	1 131,8	0,05	0,23	0,39	5,1	48,7	23,8	Mixed
C5	1 131,8	0,11	0,16	0,33	2,9	31,8	22,8	Male
C6	1 080,9	0,15	0,36	0,39	2,6	42,2	25,9	Female
Total	12,662,1	0,34	0,66	0,53	2,1	46,8	25,9	

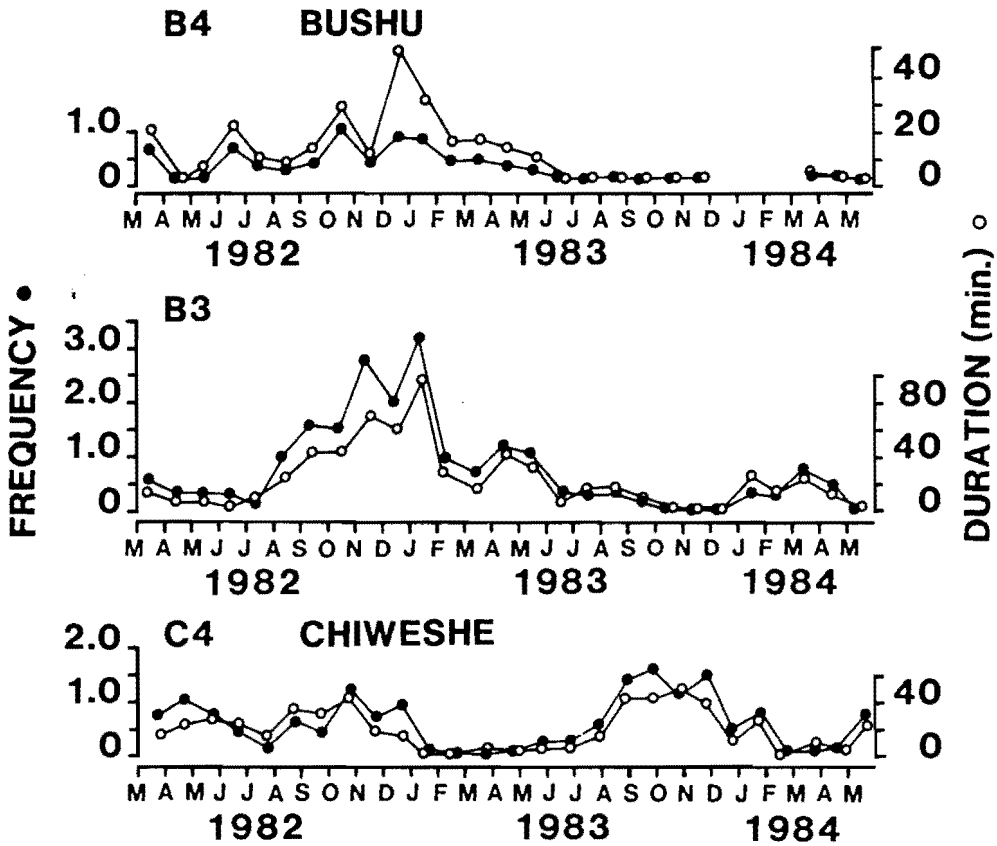
1 Crossing/collecting and washing the extremities 2 Washing clothes/utensils 3 Bathing/swimming/playing in water.

foam and animal excreta which made them unattractive for human use. The intermediate sites (C4, C5 and C6) in Chiweshe were affected by drought to a lesser extent than sites in Bushu and contact continued throughout the study although with a noticeable decrease from January 1983 to July 1983 (Fig. 2).

Seasonal variation in incidence

There was a marked decline in incidence of *S. haematobium* and *S. mansoni* in school children from period I (July 1982 to March 1983) to period II (March 1983 to March 1984) and this decline is seen in all the four schools studied (Fig.4).

FIGURE 2 - *Seasonal variations in frequency of human water contact and duration of contact in minutes per hour of observation at a temporary site (B4) and at intermediate sites (B3 and C4) in the study areas*



High contact was recorded at the permanent sites (B5, B6, C1, C2 and C3) throughout the study as water availability was not a limiting factor (Fig. 3). Thus, the drop in the number of contacts in the cool, dry season (June-August) was probably due to low temperatures, while the increase in contacts during the hot, dry season (September-November) was probably due to high temperatures (Fig. 3). There were moderate - occasionally-high contacts during the rains (December-February) and warm, post-rainy reason (March-May) and other factors such as agricultural activities may be involved.

FIGURE 3 - *Seasonal variations in frequency of human water contact and duration of contact in minutes per hour of observation at permanent sites (B5 and C1) in the study areas*

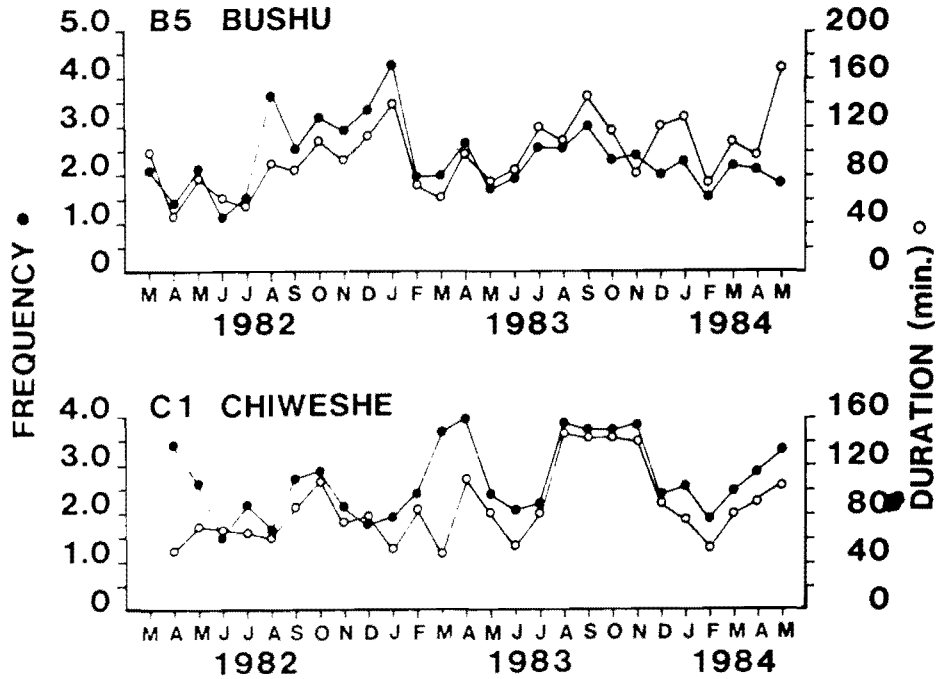
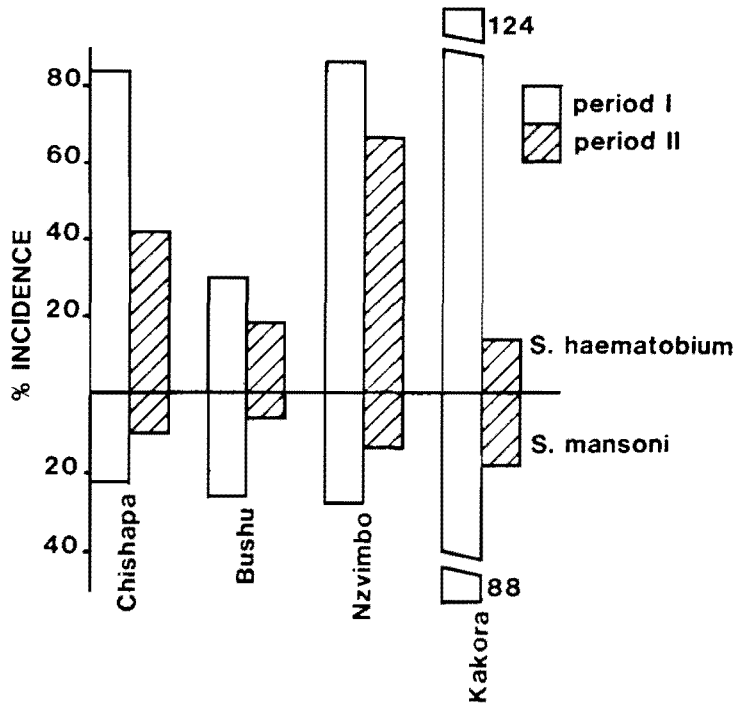


FIGURE 4 - *Incidence of S. haematobium and S mansoni in school children in the study areas during 1983-4 (extrapolated to 365-day intervals for each period of study)*



DISCUSSION

Observations of water contact activities showed that most activities were for domestic (washing clothes and utensils) and recreational (bathing, swimming and playing in water) purposes (Table I). These results are in agreement with similar studies made in other endemic areas.[1-3,7] The classification of sites into male and female (Table I) and the earlier findings of age aggregations at sites in Zimbabwe[7] clearly show that sex/age groups are important in studies of water contact. These sex/age aggregations at sites are probably encouraged by the hierarchical system of the Shona[12] which favours males and older persons whose contacts with water are mainly for bathing. Women and children should be considered to be high risk groups in the community, requiring priority action because they have a lower position in the hierarchy and have more contact with water, not only through their personal needs, but also because they have to wash clothes and utensils for their households. Furthermore, sites can be considered to be meeting places, not only for washing clothes or bathing, but for communication and discussion of matters of common interest.

Therefore, an effective intervention strategy that involves the provision of piped/borehole water should take into account the distinct age/sex heterogeneity in contact. Thus, certain ponds in the streams should be kept snail-free for use in swimming by boys and girls, separate bathing rooms should be constructed for males and females and washing slabs for washing clothes.

In spite of the fact that the role of human water contact behaviour in the elucidation of the dynamics of schistosomiasis transmission is increasingly being recognized,[13] few studies have specifically looked at the main factors influencing contact. It was shown in the present study that water availability and temperature were the major factors limiting and governing the patterns of contact at temporary, intermediate and permanent sites.

Thus, the marked reduction or complete cessation in contact at some sites in the study areas (Fig. 2) could be attributed to unavailability of water due to poor rains, The significant decline in incidence of both *S. haematobium* and *S. mansoni* from period I (July 1982 to March 1983) to period II (March 1983 to March 1984) should to an extent be attributed to this corresponding decline in water contact at some of the sites (Fig. 2) although the drought conditions experienced during the study can also have an adverse impact on the snail populations. The observation of a decline of incidence clearly points out the potential benefit to be accrued from concerted education campaigns and provision of safe water sources to decrease water contact with natural water. The findings of high contacts at the permanent sites, particularly in the latter part of the study (Fig. 3), were likely due to increased concentration of people at the sites as water became unavailable or unfit for human use at other sites.

At the permanent sites water availability did not appear to be a limiting factor. Thus, the drop in the number of contacts during the cool, dry season (June-August) was probably due to the low temperatures resulting in voluntary reduction in contacts, while the increased contacts in the hot, dry season (September-November) was probably due to high temperatures stimulating increased contacts (Fig. 3). An accompanying study[9] and other observations in other endemic areas with corresponding climatic conditions[6,8] have demonstrated intense transmission during the hot, dry season and a marked reduction in transmission during the cool, dry season. The practical implication of these observations is that if people could be educated to avoid contact in the hot, dry season and limit it to the cool, dry season when natural waters are least infective, then the prevalence of infection in the human population should be reduced.

The situation of water contact in the rainy (December-February) and post-rainy period (March-May) at the permanent sites (Fig. 3) could be associated with cycles of occupational activities, as was reported in other studies carried out in St Lucia and Zimbabwe.[2,7] Low contacts found at the permanent sites in Chiweshe in the rainy season could possibly be due to agricultural activities which limited the time available for contact, while people had more time for contact in the post-rainy period when agricultural activities were less intense. At the permanent sites in Bushu, the effect of agricultural activities on contact was probably confounded by the more profound

influence of water availability. At the Bushu permanent sites, the high numbers of people recorded in the rainy season could be explained by movement of people to these areas as water became absent or inadequate at the temporary and intermediate sites.

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REFERENCES

1. Farooq M, Mallah MB. The behavioural pattern of social and religious water-contact activities in the Egypt-49 bilharziasis project area. *Bull WHO* 1966; 35: 37-87.
2. Dalton PR. A sociological aproach to the control of *Schistosoma mansoni* in St Lucia. *Bull WHO* 1976; 54: 581-95.
3. Dalton PR, Pole D. Water contact patterns in relation to *Schistosoma haematobium* infection. *Bull WHO* 1978; 56: 417-26.
4. Chandiwana SK. How *Schistosoma mansoni* eggs reach natural waterbodies. *Trans Roy Soc Trop Med Hyg* 1986; 80: 963-4.
5. Clarke V de V. Some aspects of the epidemiology of bilharziasis in Rhodesia. *Rhod Sci News* 1972; 6: 312-17.
6. Pitchford RJ, Meyling AH, Meyling J, Dutoit JF. Cercarial shedding patterns of various schistosome species under outdoor conditions in the Transvaal. *Ann Trop Med Parasitol* 1969; 63: 359-71.
7. Husting EL. Sociological patterns and their influence on the transmission of bilharziasis. *Cent Afr J Med* 1970; 16 (suppl): 5-11.
8. Shiff CJ, Evans AC, Yiannakis C, Eardley M. Seasonal influence on the production of *Schistosoma haematobium* and *Schistosoma mansoni* cercariae in Rhodesia. *Int J Parasitol* 1975; 5: 119-23.
9. Chandiwana SK, Christensen NO, Frandsen F. Seasonal patterns in the transmission of *Schistosoma haematobium, S. mattheei* and *S. mansoni* in the highveld region of Zimbabwe. *Acta Tropica* (in press).
10. Chandiwana SK, Clarke V de V, Taylor P. Prevalence and intensity of schistosomiasis in two rural areas in Zimbabwe and their relationship to village location and snail infection rates. *Ann Trop Med Parasitol* (in press).
11. Weber MC. Miracidial hatching in the diagnosis of bilharziasis. *Cent Afr J Med* 1973; 19 (suppl): 11-14..
12. Gelfand M. *The genuine Shona. Survival values of an African culture.* Gwelo: Mambo Press, 1973.
13. World Health Organization Workshop on the Role of Human/Water Contact in Schistosomiasis Transmission, St Lucia, 28 May -1 June 1979. Geneva: unpublished document TDR/SER-HWC/79.3, 1979.

REVIEW ARTICLE

Psychological Disorders in Africa
II: Clinical Issues

AP REELER

SUMMARY

A previous article has examined the data relating to the prevalence of psychological disorders in Africa.[1] It was shown that psychological disorder is common in Africa, and is distributed with the same frequency both 'within' and 'between' cultures. It was further shown that, despite high rates of attendance at general medical settings, there was an inversely low rate of detection by medical personnel. It was not clear whether this low rate of detection was due to the low awareness of health-care personnel or to the manner in which psychological disorder presents. Furthermore, it was concluded that rates of disorder are independent of cultural factors, at least insofar as culture (or acculturation) would seem to contribute little to the genesis of psychological disorder.

The current article examines the issues surrounding the problem of the low rate of detection of psychological disorder. It examines firstly the data relating to the presentation of disorder, noting the

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