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Resurgence of Schistosoma Haematobium Infection after Mass Chemotherapy in Rural Cross River State

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Abstract

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Background: Selective mass chemotherapy is known to be very effective in reducing and controlling the prevalence of urinary schistosomiasis. However, re-infection and resurgence of Schistosoma (S) haematobium infection after effective mass chemotherapy is also common in the absence of other control programmes.

Objective: To determine the prevalence of S. haematobium infection among primary school children in a rural community, ten years after effective mass chemotherapy in the same school.

Subjects and Methods: The prevalence and intensity of S. haematobium infection were determined in a rural primary school by the nytrel milipore filter method in 2003. The results were compared with those of a similar study carried out in the same primary school ten years earlier, before and after effective mass chemotherapy.

Results: In the current study, two hundred and twenty six of the 443 children studied had urinary schistosomiasis giving a prevalence of 51.0 percent. One hundred and seventy five (77.4 percent) of those infected had infection of mild intensity (<49 ova/10ml). A previous study, carried out 10 years earlier in the same school had shown a drop in prevalence of infection from 69.0 percent to 21.7 percent following treatment and re-treatment with praziquantel within a two-year period. Compared to the 21.7 percent prevalence obtained after two years of retreatment ten years previously, there was a rise of prevalence to 51.0 percent in this study ($p < 0.001$).

Conclusion: This study shows that the prevalence of S. haematobium among the school children was high, 10 years after effective mass chemotherapy in the same school. However, the intensity of infection was milder. We conclude that there is a need to control infection through a multifaceted approach.

Key word: Urinary schistosomiasis, mass chemotherapy, resurgence

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Introduction

SCHISTOSOMA haematobium infection has been with man for a very long time.[1] There are estimated 200 million people infected worldwide with 90 million persons infected in the agricultural areas of 52 endemic countries in the eastern Mediterranean region and Africa.[2-4] In Nigeria, high prevalence rates have been reported from various parts of the country.[5-7] The bulinic snails, which are the intermediate hosts of the parasite, live in fresh water and have been reported to perpetuate infection in Nigeria.[8] The damage caused by the infection may lead to hydronephrosis, as well as calcification/ contraction of the bladder.[9] These changes may

result in hypertension, growth failure and renal failure in later life.[2] This makes the disease a major health problem.[2,10] Although several control measures exist to prevent infection,[2,11] there is still general apathy by governments and other stakeholders to act to reduce this scourge. Selective mass chemotherapy has been shown to be effective in reducing the prevalence and intensity of S. haematobium infection.[2] Its feasibility, cost effectiveness and need for minimal technical expertise make it one of the most effective single control measure.[2,12] Nonetheless, re-infection and resurgence in transmission of infection after mass chemotherapy is well known.[2, 13-15]

The aim of the present study was to determine the prevalence of S. haematobium infection in Adim community of Cross River State, a known endemic area, ten years after a mass chemotherapy programme in the community and to compare the two prevalences.

Subjects and Methods

The study was conducted in Adim community, Biase Local Government Area of Cross River State. The village is located in the rain forest region of south-eastern Nigeria, 110km to the north of the Atlantic ocean. The community makes use of one large stream for domestic needs, washing and recreation such as swimming. Sewage disposal is mainly by "communal open toilets".

The same and only primary school in Adim that was used a study 10 years earlier, was again chosen for the study which was conducted between September and October, 2003. The subjects were recruited by randomly selecting three streams from each class of five. There were 4-7 streams per class. From each stream, subjects were randomly selected by the use of table of random numbers. Inclusion criteria included the following: residence in the community for at least six months, no history of intake of anti-schistosoma drugs in the preceding three months, no clinically obvious genito-urinary lesions or trauma, and with respect to the older girls, no menstrual bleeding for at least, five days prior to the study. Excluded from the study were children resident less than six months in the community and those that had taken anti-schistosoma drug within three months of the study. Before commencement of the study, approval was obtained from the Cross River State Primary Schools Management Board, the school headmaster and teachers and also from the Ethics/Research Committee of the University of Calabar Teaching Hospital.

Using a pre-tested questionnaire, symptoms related to the genito-urinary system (frequency, strangury, suprapubic pain, nocturia, enuresis) were obtained from all the children studied. Collection of urine specimens for schistosoma ova was done between 10:00 am and 2:00 pm when ova count of S. haematobium is expected to be at its peak.[16] For this purpose, the subjects were given a wide-mouthed, screw capped 40ml container each and were told to run once, to and from across the school field before emptying their bladder into the specimen bottles. Each urine specimen was first examined for gross haematuria before analysis was carried out, using combi-9 strips (*Macherey-Nagel, Germany*). Ova were counted using Nytrel (polyamide) millipore filter as described by Mott.[17] Each urine sample was mixed by drawing it in and out of a disposable 10ml plastic syringe with a 5cm extension of plastic tubing mounted on an adaptor. Ten milliliters of the urine was then withdrawn and the plastic extension removed. The urine so withdrawn was injected through a 12mm diameter swine filter support containing 13mm Nytrel Ti 20HD filter with a mesh size of 20 microns. Once the urine was completely expressed from the syringe, the syringe was removed, filled with air and injected into the filter holder. The procedure was repeated twice to remove excess urine and to force the ova to adhere to the surface of the filter. The filter support was then opened and the filter removed with forceps and placed face upwards on a glass slide. A drop of saline was added to prevent drying. A drop of Lugols iodine solution was placed on the filter to stain the ova. The filter was then examined under a light microscope (10 x magnification) and the number of eggs on the entire filter was counted with the aid of a hand counter and expressed as number of eggs per 10ml of urine. The presence of ova of S. haematobium in the urine was considered diagnostic of urinary schistosomiasis. The intensity of infection by ova count was graded as light (1-49 ova per 10ml), moderate (50-100 ova per 10ml), and heavy (> 100 ova per 10ml).[18]

The result of similar studies on the prevalence and intensity of S. haematobium before and following treatment and re-treatment of school children carried out in the same school[19] 10 years earlier, were compared with the results of the present study. The data was analysed using EPI info 2002 version. Proportions were compared between groups of discrete variables using relative risk, confidence interval, Fisher exact test, and Chi-square (X^2) test with Yates' correction as appropriate.

Results

Four hundred and forty-three children were examined. Of these, 235 (53.0 percent) were males and 208 (47.0 percent) females. Their ages ranged between five and 15 years. Figure 1 shows the age and sex distribution of the study population. Table

I shows the trend in the prevalence of urinary schistosomiasis with age among males and females. Overall, 226 (51.0 percent) of the 443 children were infected. Out of the 235 males, 121 (51.5 percent) were infected while 105 (50.5 percent) of the 208 females were also infected. There was a significant difference in the prevalence rates between males and females only at the 12-15 years age bracket when more females were affected ($x^2 = 3.85$, $P < 0.049$). Table II shows the intensity of infection by age and sex. One hundred and seventy five (77.4 percent) of the 226 infected children had mild infection, 31 (13.7 percent) had moderate and 20 (8.9 percent) severe infection. There was no significant difference in the intensity of infection between males and females in any of the age groups (RR (95%CI) = 1.32 (1.02-1.71). Table III compares the prevalence and intensity of S. haematobium infection in the present study (2003) with those obtained in a previous study before and after treatment with yearly praziquantel (1993, 1994 and 1995). There was a steady decline in the prevalence rate from 69.0

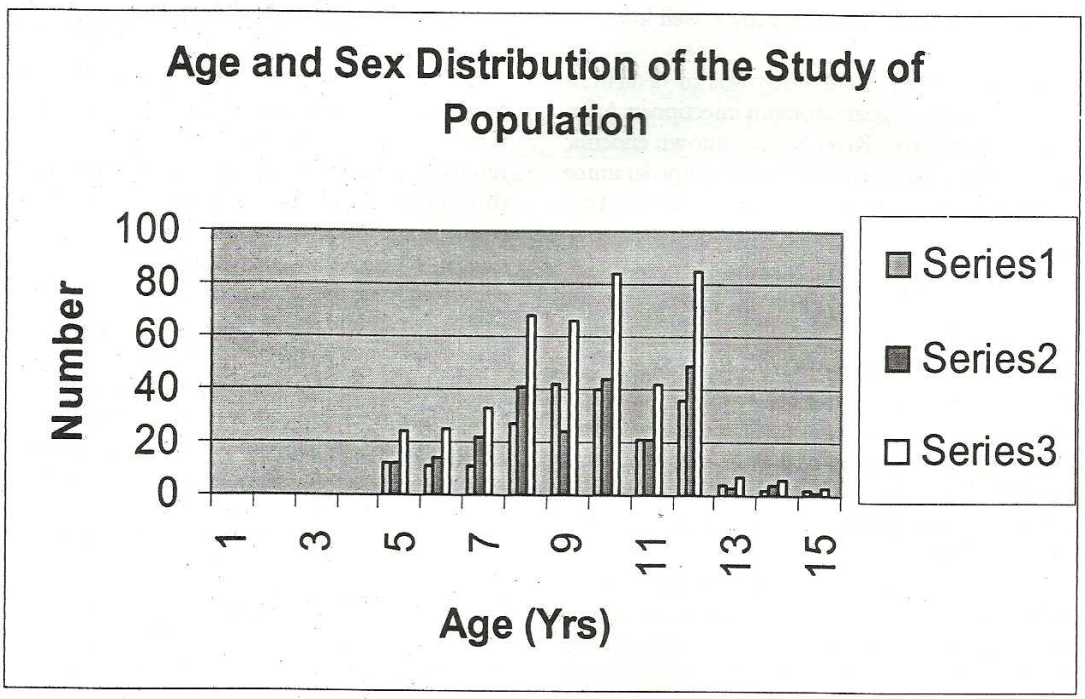

Fig. 1: Age and sex distribution of the patients

Table I

Prevalence of Infection in relation to Age and Sex

	Male		*Female*		*Both Sexes*				
Age (yr)	*No Exam*	*Infected No. (%)*	*No Exam*	*Infected No. (%)*	*No Exam*	*Infected No. (%)*	*RR(95%CI)*	*X^2*	*P*
5-8	89	34(38.2)	61	18(29.5)	150	52(34.7)	0.79(0.51-1.22)	0.85	0.18
9-11	89	55(61.8)	103	54(52.4)	192	109(56.8)	0.80(0.58-1.12)	1.72	0.19
12-15	57	32(56.1)	44	33(75.0)	101	65(64.4)	1.66(0.96-2.87)	3.07	0.04
Total	235	121(51.5)	208	105(50.5)	443	226(51.0)	0.98(0.81-1.18)	0.04	0.83

Key: No exam = number examined.

Table II

Intensity of S. haematobium Infection in relation to Age and Sex

Intensity of infection	*Age/Sex*						*Total*
	5- 8yrs		*9-11yrs*		*12-15yrs*		
	M(%)	*F(%)*	*M(%)*	*F%)*	*M(%)*	*F%)*	
Mild	27(15.4)	12(6.9)	42(24.0)	42(24.0)	22(12.6)	30(17.1)	175(100)
Moderate	4(12.9)	4(12.9)	9(29.0)	8(25.8)	5(16.1)	1(3.2)	31(100)
Severe	3(15.0)	2(10.0)	4(20.0)	4(20.0)	5(25.0)	2(10.0)	20(100)
Total	34(15.0)	18(8.0)	55(24.3)	54(23.9)	32(14.2)	33(14.6)	226(100)

Table III

Prevalence and Intensity of S. haematobium Infection in an Earlier Study (1993-1995)[19] and Present Study

Characteristics	*1993 Pre-TX*	*1994 Post–TX (1)*	*1995 Post–TX (2)*	2003 (*ten years after*)
	n (%)	*n (%)*	*n (%)*	*n (%)*
Number examined	210	183	203	443
Prevalence of S. haematobium (%)*	145/210 (69.0)	83/183 (45.4)	44/203 (21.7)	226/443 (51.0)
Geometric mean egg count (per 10 ml of urine)**	598	408	65	20

*Key: * Values obtained before treatment in each year* ** *Zero count excluded* *TX = Treatment*

percent to 21.7 percent following treatment and re-treatment with praziquantel. The prevalence of 51.0 percent in the present studywas significantly higher than the 21.7 percent obtained previously ($X^2 = 21.37$, $p < 0.001$). The mean ova count of infected children was 20 ova/10ml of urine. Comparing this with the previous mean ova count of 65 ova/10ml of urine seen 10 years ago, there was statistical significant difference in the intensity of infection ($X^2 = 63.72$, $p < 0.001$).

Discussion

Schistosoma haematobium is highly endemic in Adim as seen in the 51.0 percent prevalence recorded in this study. This prevalence rate is not much different from the 43.5 percent[20] and 69.0 percent[19] previously recorded in the same community in 1991 and 1993, respectively. The study also showed that more females than males were affected at the age bracket, 12-15 years, in terms of prevalence. This may be explained by the fact that in the village, girls at this age do most of the domestic chores including fetching of water for domestic use, where contact is made with water. The observation however, contrasts with the report of a higher prevalence and intensity of infection among males in western Nigeria.[16]

The intensity of infection in the current studywas generally light as 77.4 percent had mild infection. This might have been due to the fact that the current

study was conducted in the rainy season when infection is thought to be low.[8] In the rainy season, there is availability of water and so infectivity is low as few people go to the stream at this period. It is also possible that the intermittent mass treatment of infection in this community by previous workers was responsible for the low intensity of infection as fewer eggs are passed onto the water bodies.

In a previous study in the same school by Meremikwu *et al*,[19] ten years earlier, the prevalence of infection steadily declined from 69.0 percent to 21.7 percent following treatment with praziquantel in a 24-month period. However, there was resurgence in prevalence ten years later, from 21.7 percent to the 51.0 percent seen in this study. The results were similar to those of other studies in Niger,[15] Cote d' Voire,[21] and Kenya[22] where resurgence in infection was seen after significant reduction in the prevalence and intensity of infection following treatment. Such resurgence may be due to the fact that the treatment and re-treatment in the previous study being compared to this one, was school-based chemotherapy that was restricted to children only. This left out the adult population who had probably continued to contaminate the water bodies and therefore sustain infection in the community. Even more importantly, the mass chemotherapywas not accompanied by the provision of potable water supply and better facilities for human waste disposal. The factors that sustain infection in the community therefore remained largely unchanged. However, the intensity of infection ten years later was significantly lower and may reflect some persisting salutary effect of the mass chemotherapy programme. The WHO has recommended that schistosomiasis control should be used as an entry point to the provision of social amenities such as potable water, improved human waste disposal (VIP toilets) and behavioural changes in endemic communities. This recommendation should be followed in this and other endemic communities. Incidentally, the Cross River State government in partnership with the United Nations Development Project (UNDP) is about to provide potable pipe borne water to this community and the surrounding communities. This, in addition to the recommendation to carry out mass chemotherapy may reduce the prevalence of infection in the community.

Conclusion

It is concluded that the prevalence of S. haematobium infection among children in Adim was high 10 years after mass chemotherapy, although the intensity of infection was lighter. There is need for a multifaceted approach to control infection. Mass chemotherapy should be given to the whole community and not restricted to a section of the population. Other control measures such as provision of potable water, health education and establishment of proper waste disposal system like VIP toilets, should go on concurrently with mass chemotherapy for effective control and eradication of infection.

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