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PREVALENCE AND INTENSITY OF URINARY SCHISTOSOMIASIS IN PRIMARY SCHOOL CHILDREN OF THE KOTTO BAROMBI HEALTH AREA, CAMEROON

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ABSTRACT

Objective: **To assess the prevalence and intensity of urinary schistosomiasis in school pupils aged five to sixteen years.**
Setting: **Barombi Kotto Health Area, southwest Cameroon.**
Design: **A cross-sectional study.**
Subjects: **Three hundred and forty seven primary school children.**
Intervention: **All children found to be infected were treated with praziquantel (biltricide).**
Main outcome measures: **The study would be able to provide baseline information on the epidemiology of schistosomiasis which is vital for control strategies.**
Results: **The overall prevalence of *Schistosoma haematobium* in the study areas was 53.6%, with the highest prevalence of 73.9% recorded in Barombi Kotto village. Children resident on Barombi Kotto island were more significantly infected than those on the peripheral mainland (93.3% versus 46.2%, $p < 0.01$). Prevalence rate and intensity of infection did not vary significantly ($p > 0.05$) with sex, class or age of the pupils. The mean egg count varied significantly between schools ($p < 0.001$).**
Conclusion: **Barombi Kotto village was identified as the focus of urinary schistosomiasis, with the highest recorded in children dwelling on the island, the surrounding lake being the main focus of transmission. Focal snail control as an adjunct of chemotherapy and intensive health education for the local population are strongly recommended as a means of reducing the high infection rate in the area.**

INTRODUCTION

Schistosomiasis is unevenly distributed in Cameroon and involves three species, namely: *Schistosoma haematobium, S. mansoni* and S. *intercalatum* in diminishing order of predominance. Although more than 50% of the population may be infected in some areas, a National Bilharziasis Survey carried out between October 1985 and November 1989 defined the full extent of the disease, estimating the prevalence to be 3.1%(1). Up to date epidemiological data on schistosomiasis in Cameroon are not available due to the dysfunctioning of the National Bilharziasis Research Institute since 1987. This has made eradication or the spread of the infection to new areas difficult to manage.

The present study which is intended to obtain information regarding the prevalence and intensity of *S. haematobium* will, give baseline data on the present state of the disease in the Kotto Barombi Health Area of Cameroon.

MATERIALS AND METHODS

Study area: The Kotto Barombi Health Area is located some 33 km southwest from Kumba town, Cameroon and harbours a circular lake, Lake Barombi Kotto, which is about 1.3 km in diameter and less than six metres deep in most places with a small inlet stream on the southern shore and an outlet stream opposite it. Located in the centre of the lake is the Kotto Island, where the indigenous inhabitants live. Drinking water for residents of the Island is fetched by canoe from the inlet stream and a nearby spring, an indication that the inhabitants of the area are in constant contact with the highly infected lake. Surrounding Barombi Kotto village are the adjacent villages of Foe Bakundu, Kuke Mbomo and Bai Foe to the west, and New Town Barombi and Bai Panya to the east.

Study population: The indigenous inhabitants of Barombi Kotto are resident on the Kotto Island and number about 1200-1500. The mainland, occupied mainly by non-indigenous inhabitants, has a population of between 1500 and 2000. The population selected for this study was made up of 347 primary school children attending six primary schools located in the six villages of the Kotto Barombi Health Area.

Parasitological survey: Informed consent forms were used to select children from classes 3, 5 and 7. Exceptionally in Presbyterian School (PS) Barombi Kotto, children of classes 1 and 2 were also sampled because of the proximity of that particular school to the lake. The selected children were each given a container bearing the pupil's names and identification number, and then instructed on how to collect the urine samples. Collection was done between 10.00 a.m. and 2.00 p.m. to coincide with the peak excretion of eggs(2). The urine was stored away from the sun to prevent hatching of schistosome eggs. The syringe filtration technique(3) employing nytrel polycarbonate membranes (Whatman Inc., Clifton, New Jersey, USA) was used as method for concentration of *Schistosoma haematobium* eggs in the urine samples before staining and quantification. Hemastix and albustix reagent strips (Bayer Corporation, USA) were used for quantitative estimation of haematuria and proteinuria respectively. The data was analysed on EPI- INFO programme by performing Chi square and Student's t-test and; analysis was done in relation to sex, age, class and geographical location of the residence of the pupils sampled. P values less than 0.05 were considered significant.

RESULTS

The prevalence of *S. haematobium* in the Kotto Barombi Health Area was 53.6 %. The highest prevalence (73.9 %) of *S. haematobium* was recorded in PS Barombi Kotto followed by 14.3% in GS New Town Barombi five kilometres east of the lake, 71% GS Bai Panya, nine kilometres east of the lake, and 3.1% in GS Kuke Mbomo, three kilometres west of the lake (Table 1). The trend for proteinuria and haematuria was similar to that for the parasites (Table 1). The haemastix reagent strips for haematuria gave a sensitivity of 90.9% and a specificity of 94.5% in detecting schistosomiasis in urine samples. The albustix reagent strips for proteinuria gave only 83.1% sensitivity and 84.7% specificity when compared with the results from filtration and microscopic examination of ten millitres urine samples. The mean number of eggs per 10ml of urine was highest in PS Barombi Kotto (576±865) and lowest in GS Foe Bakundu and CPS Bai Foe, both of which recorded no schistosome infection. There were no significant differences in prevalence and intensity of infection ($p>0.05$) between the sexes, classes or age of pupils (Table 2), although a drop was observed in the 13 - 14 years age group and above. It should, however, be cautioned that only a few number of pupils were examined in the age group 15 -16 years.

Children resident on the Kotto Island were more infected (93.3%) than those resident on the peripheral

Table 1

Prevalence and intensity of schistosomiasis in primary school children of the Kotto Barombi Health Area

School	Distance from Barombi Kotto	No. of pupils	Percentage prevalence			Intensity of infection (egg count/10 ml urine)		
			Proteinuria	Haematuria	Schistosomiasis	Mean ± SD	Range	Median
P.S. Barombi Kotto	0 km	180	65.5	76.0	73.9	567 ± 865	0 - 3486	166
Govt School New Town Barombi	East, 5 km	21	23.8	23.8	14.3	1 ± 3	0 -10	0
Govt School Bai Panya	East, 9 km	28	25.0	10.7	7.1	12 ± 55	0 - 289	0
Govt School Kuke Mbomo	West, 3 km	32	33.3	9.4	3.1	4 ± 22	0 - 120	0
Govt School Foe Bakundu	West, 5 km	36	16.7	2.8	0	0	0	0
Community Primary School Bai Foe	West, 6 1/2 km	50	110.0	2.0	0	0	0	0
Health area		347	49.5	49.8	53.6	353 ± 731	0 - 3486	41

Table 2

Urinary schistosomiasis: prevalence and intensity of infection in Barombi Kotto by sex, class and age of pupils

Item		No. of pupils	Percentage prevalence			Intensity of infection (eggs per 100ml urine)		
			Proteinuria	Haematuria	Schistosomiasis	Mean ± SD	Range	Median
Sex:	Male	90	61.1	67.8	81.1	598 ± 907	0 - 3486	111
	Female	85	68.2	81.2	88.0	572 ± 844	0 - 3065	180
Class:	1	52	67.3	71.2	71.2	613 ± 957	0 - 3486	108
	2	42	73.7	78.6	76.2	919 ± 1032	0 - 3091	240
	3	32	65.6	81.3	78.1	455 ± 660	0 - 2990	233
	5	37	64.8	72.9	78.4	397 ± 639	0 - 3240	212
	7	19	47.4	73.7	78.9	256 ± 648	0 - 2881	86
Age (yrs)	5-6	44	65.9	72.7	72.7	832 ± 1102	0 - 3486	146
	7 - 8	63	71.4	79.4	76.2	624 ± 864	0 - 3091	107
	9 - 10	13	61.5	61.5	61.5	331 ± 470	0 - 1650	233
	11 - 12	26	69.2	84.6	88.0	376 ± 685	0 - 3240	155
	13 - 14	20	65.0	80.0	75.0	511 ± 890	0 - 2990	129
	15 - 16	6	16.7	66.7	50.0	53 ± 87	0 - 211	0

mainland (46.2%) ($p<0.001$). The majority of pupils (71.8% of females and 71.1% of males) had egg counts <500/10 ml urine.

DISCUSSION

Lake Barombi Kotto is known to harbour the snail intermediate hosts (*Bulinus camerunensis* and *B. rohlfsi*) of *Schistosoma haematbium*(5,6). Studies by Moyou *et al*(6) revealed cercarial hatching in 18.9% and 38.3% of snails of *B. camerunensis* and *B. rohlfsi,* respectively. A survey by Moyou *et al*(4) in Barombi Kotto village gave a *Schistosomiasis haematobium* prevalence rate of 76%. Contrary to the consensus that the transmission cycle had been disrupted following the national campaign in November 1987(1), the present study shows that Barombi Kotto is still hyperendemic for bilharziasis.

National surveys between October 1985 and November 1989 estimated the prevalence to be 3.1%(1). The present survey has demonstrated that active transmission is still going on and that the incidence of urinary schitosomiasis is on the increase. The highest prevalence (73.9%) was recorded in PS Barombi Kotto, a school situated on the mainland, just on the shore of the lake focus. The pupils living on the Kotto Island are regularly exposed to the source of infection, as they must cross the lake daily to get to and from school. Furthermore, due to lack of pipe-borne water on the island, children are forced to fetch drinking water from a spring situated on the mainland. The other schools in the neighbouring villages had either a spring or a well as their source of drinking water. Their distances from the lake may be responsible for the low prevalence of schistosomiasis in those villages, an indication that the disease is strictly localised and the spread, if at all possible, is very minimal and is through the small outlets or floods from the lake. All infected subjects recorded a daily contact with water, either through fetching household water by canoe, swimming or washing in the lake. These results reveal a higher prevalence than those observed in Makenene, Cameroon where a prevalence of 36.2% was recorded(7), but are comparable to those recorded in 1984 for Barombi Kotto village(6).

The intensity of infection was highest again at PS Barombi Kotto with a mean egg count of 576 ± 865 per 10ml urine. The difference in mean egg count between the schools was highly significant ($p<0.001$), an indication that the frequency of contact with the site of infection must be present for reasonable infection to occur. The pupils infected in the other schools (Kuke Mbomo, New Town Barombi and Bai Panya) gave a history of previous residence on the mainland Barombi Kotto; hence their infections were imported from Barombi Kotto. No significant difference was recorded between the sexes, since both sexes were equally exposed to infection due to activities which brought them to the source of infection. While the young boys went fishing, the girls went fetching water or washing household utensils in the lake.

Higher mean egg counts were recorded in children in the first decade of life than those in the second. This is due to the fact that household activities and exploratory swimming in the African setting are performed by children of this age group and such activities are effected between 9.00 am and 2.00 pm hours which coincides with the period for maximum cercarial shedding(8). The diagnostic methods used in this study support the idea proposed by other investigators that under field conditions the sensitivity and specificity of haematuria alone were sufficient for diagnosis(9). The development of a degree of immunity is reflected in the reduced intensity of infection around mid-adolescence.

The study strongly recommends the necessity to supply the Barombi Kotto village, including the Island, with safe and portable water supply as a means to curb the transmission of this disease. Since the focus of transmission has been identified as the lake, there is need for intensive health education of the local population, especially children of school age, on the risk involved in contact with contaminated water and how to avoid infection as well as the danger of voiding urine in the lake. A safer means of transportation across the lake is needed to reduce the risk of exposure when locally made boats capsize. Focal snail control as the adjunct of chemotherapy programmes should be integrated with the above measures in order to drastically reduce the prevalence rate in the foreseeable future.

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REFERENCES

1. ANON. Rapport enquete nationale sur lar Bilharziose. The African schistosome News Letter, No. 4, IMPM Yaounde, 1988.
2. Peters, P.A., Mahmoud, A.A., Warren, K.S., Ouma, J.H. and Arap Siongok, T.K. Field studies of a rapid, accurate means of quantifying *Schistosoma haematobium* eggs in urine samples. *Bull. Wld. Hlth. Org.* 1976; **54**:159.
3. Peters, P.A., Warren, K.S. and Mahmoud, A.A.E. Rapid, accurate quantification of schistosome eggs via Nucleopore filters. *J. Parasitol.* 1976; **62**:154.
4. Mott, K.E., Dixon, H., Osei-Tutu, E., England, E.C., Ekue, K. and Tekle, A. Evaluation of reagent strips for detection of *Schistosoma haematobium* infection: A comparative study in Ghana and Zambia. *Bull. Wld. Hlth. Org.* 1985; **63**:135.
5. Duke, B.O. and Moore, P.J. The use of molluscicide in conjunction with chemotherapy to control *schistosoma haematobium* at the Barombi Lake foci in Cameroon. *Tropenmedezin und parasitilogie.* 1976; **27**:297, .
6. Moyou, S.R., Enyong, P.A., Dinga, J.S., KouamouoJ. and Ripert, ch. Controle de la Bilharziose urinaire dans le foyer de Barombi Kotto. 1. Evaluation preliminaire du niveau d'endemicite. *Rev. Sci. Sante).* 1984; 1-2:**77**.
7. Akufongwe, P.F., Onwuliri, C.O.E., Titanji, V.P.K. and Okwuosa, V.N. Prevalence of schistosomiasis and other intestinal helminth infections among senior primary school children in Makenene Sub-Division, Cameroon. *J. Helminthol.* 1995; **69**:103.
8. Ukoli, F.M.A. Introduction to parasitology in Tropical Africa. Textflow Limited, Ibadan, Nigeria, 4th Edition p 57,1995.
9. Savioli, L. and Mott, K.E. Urinary schistosomiasis on Pemba Island: Low cost diagnosis for control in a Primary Health care setting. *Parasitology.* 1989; **5**:333.