

Epidemiological Survey of Schistosomiasis Due to *Schistosoma haematobium* in Some Primary Schools in the Town of Maroua, Far North Region Cameroon

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Abstract: An epidemiological investigation to determine, the prevalence of urinary schistosomiasis parasite *Schistosoma haematobium* was conducted among children aged between 5-14 years from 15 January to 25 February 2010 in 10 public primary schools in the town of Maroua Head instead of the region of Far North Cameroon. A sample of 620 students responded to a questionnaire previously developed and these same students were subject to urine samples. The examination of urinary sediment under the microscope revealed an overall prevalence of 22.90% of bladder bilharziasis with *Schistosoma haematobium*. The age group most heavily infested was that of 9-11 years (36.40%) and less affected than 6-8 years (14.70%).

Key words: Schistosomiasis, *Schistosoma haematobium*, epidemiology, students, Maroua, Cameroon

INTRODUCTION

Parasitic diseases remain major public health problems in developing countries. Among these parasites most formidable and pervasive are prominently bilharzias, malaria, helminthiasis, amoebiasis and lymphatic filariasis (WHO, 1993a, b). The urinary and intestinal schistosomiasis occupy a second place after malaria (Euzéby, 1979; Mayaka, 2001). Indeed, bilharzia is a parasitic disease caused by tapeworms, blood flukes or schistosomes, trematodes with separate sexes, bloodsucking living in the circulatory system. Infection occurs when skin contact with infested waters schistosoma by bathing, washing, peaches in hot endemic countries for schistosomiasis. According to World Health Organization, in various countries, an estimated 600 million people exposed to this disease with 200-300 million people currently infected and showing symptoms, 120 million and 20 million suffering from severe and disabling (Van der Werf *et al.*, 2003). In Africa, urinary schistosomiasis is commonly reported in 44 countries. Currently, some 85% of all serious cases are in Africa (Mayaka, 2001). In Cameroon, three forms of schistosomiasis are endemic. The first presentation of their distribution in space was realized in 1968 (WHO, 1993a). A zoning map for *Schistosoma haematobium*,

Schistosoma mansoni and *Schistosoma intercalatum* is also established in Cameroon. Various studies have very well been localized to refine the terms of the distribution of parasitic diseases, particularly in northern Cameroon (WHO, 1993a, b). According to an annual medicine report, two million Cameroonians suffer from bilharzia and five million others are at risk of infection. This chronic disease affects many parts of Cameroon. The regions most affected by this condition are the three northern regions (Adamawa, North, Far North), the South West, the Littoral (Department of Mungo) and Centre (Department of Mbam and Inougou). In the region of Far North Cameroon, several studies have revealed the presence of these parasitic infections whose prevalence varies from one locality to another. The contamination is due in part to the absence of fecal and urinary health, contacts water snail men (fishermen, rice farmers, women and children) and secondly, the creation of water points: dam construction, irrigation development permanently. Attendance abundant spring water and rivers in the Sahel region promotes the spread of waterborne diseases in the case of bilharzia (Ngonseu *et al.*, 1991). Children are the age group most vulnerable to this disease (Mayaka, 2001). The Cameroonian government has for some time by the national program for the fight against schistosomiasis,

ensures systematic distribution of Praziquantel in some schools. Despite this good initiative, the problem is far from resolved with reference to the difficult living conditions to which populations are exposed to the Far North Cameroon and the entire school age children in particular. Thus a study of the prevalence of urinary Schistosomiasis in some public schools in the region of the Far North of Cameroon is a significant clue to attract the attention of government in strengthening already begun the fight against this scourge. This study aimed specifically to reach the following specific objectives:

- To determine the infestation rate of urinary Schistosomiasis in schools
- To make a breakdown of prevalence by sex and age
- To analyze and propose methods to fight against Schistosomiasis by *Schistosoma haematobium* in school

MATERIALS AND METHODS

Presentation of the study area: The Far North of Cameroon is a Sudano-Sahelian zone, located at an altitude of 400 m between the 10th and 13th degrees north latitude and between 13°15' and 15°45' East longitude. It is characterized by a wide variety of natural landscapes. The climate is Sudano-Sahelian characterized by a very short rainy season of about 5 months (June-October) and a relatively long dry season which lasts about seven months (November-May). It covers an area of about 25000 km² between Nigeria to the west and Tchad to the east. This region is one of the most populated of Cameroon with a population of 3,111,792 inhabitants (2005 census), an average density of 124 inhabitants km⁻² in 2005. The city of Maroua has 201,371 inhabitants that stretches along the banks of the Mayo-Kalialo river. The rainfall is generally about 865 mm of water per year. The temperature is about 27°C with a maximum value of 32°C (April-May) and a minimum value of 24°C (December-January). The vegetation consists of thorny steppes Sahel. The town of Maroua is divided into three districts. The site chosen for the study is the municipality of Maroua III. This district extended over an area of 480 km² has a population estimated at about 111,246 inhabitants. From the ethnic point of view, the population is composed of Guiziga, Moufou, Fulani and Kanuri. This district has 27 primary schools.

Selected schools and selection criteria: The study was conducted in 10 Primary Schools (PS) which are Djarenguol Kodeck, Djoulgouf, Dougoi, Doursoungo,

Founangue, Ibba Kaigama, Kongola-Djiddeo, Djolao Kongola, Yaeres Wuro and Malloum Yambaram. The criteria for inclusion of students in the study were as follows:

Student born and living in the administrative group of Maroua III; student group III Administrative Maroua whose former emigration, >1 year is enough to have lived the epidemiological conditions of the medium. In each school, students were recruited following classes: Initiation Section to Language (ISL), Courses (CP), Course Elementary 1st year (CE1), Elementary 2nd year Courses (CE2), Middle Course 1st year (CM1) and 2nd year Intermediate Course (CM2). This choice was made so that all school age groups (6-14 years) are covered. In each level, we have learned in meeting the criteria for inclusion in the study at least 10 students, so on average of 60 students per school targeted.

Survey: January 15 to February 25, 2010, a team of four investigators provided survey forms, boxes of samples, a white long sleeved blouse, a pen, a notepad and a marker has visited schools targeted group of district administration Maroua III. Students randomly selected met the criteria for inclusion in the study. The urine of each student interviewed is taken after the interrogation. The characteristics of each box of urine are mentioned in the notebook and on the box as shown in Fig. 1.

Search schistosome eggs: The search for the eggs of *Schistosoma haematobium* has been made in the laboratory of Life and Earth Sciences at the University of Maroua, installed at the sites of the Institute of Agricultural Research And Development (IRAD), Maroua. After centrifugation of the urine, urinary sediment obtained was collected using a dropper (pipette bulb) and

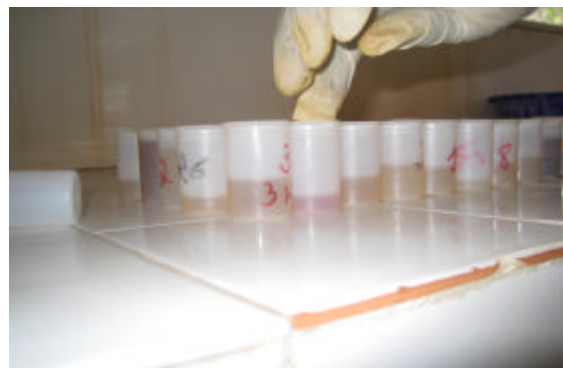


Fig. 1: Urine samples



Fig. 2: Microscope compound monocular

placed between slide and coverslip. The set was observed using an optical microscope compound monocular microscope with objective 0826594 X4 (Fig. 2). After perception of the image, the X4 lens is rotated and replaced by the X10 objective to make the image clearer. For each urinary sediment, the operation was repeated 3 times to multiply the chances to meet the eggs of *S. haematobium*.

RESULTS

The different characteristics of the sample by gender and age are shown in Fig. 3 and 4. Figure 3 shows that the majority of subjects examined is male with male students 422/620 (68.07%) and 198/620 women (31.93%). The most likely reason is that related to the behavior of females in this part of Cameroon where adult women and girls attach too much importance to their privacy. For some female students, issues related to the reproductive or taking samples of urine are a taboo subject and that only the consent of parents is a discharge. This uneven distribution of the sample may also be due to the numerical inferiority of girls to boys in many schools in the region of the Far North Cameroon. Figure 4 shows the distribution of subjects according to age groups 6-8, 9-11 and 12-14. It is found that the age group 6-8 years was the least represented with a percentage of 21.94% while the age groups 9-11 and 12-14 years are equal and the most represented (39.03%) each. Difficulties were encountered in the age group 6-8 years in understanding questions during the interview. The answers given by students of this age were more or less reliable. For this reason, researchers reduced the size of this age group to avoid skewing the results.

Symptoms reported by the subjects examined: The Table 1 showed the symptoms most encountered by students and listed in order of importance: abdominal pain (41.94%), cough (40.32%), pain on urination (39.02%),

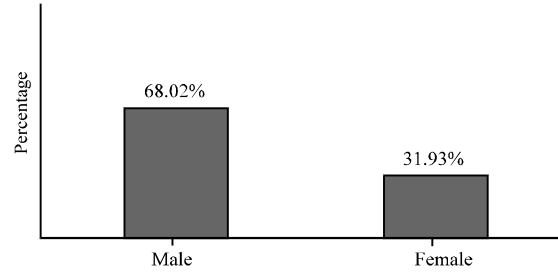


Fig. 3: Distribution of subjects by sex

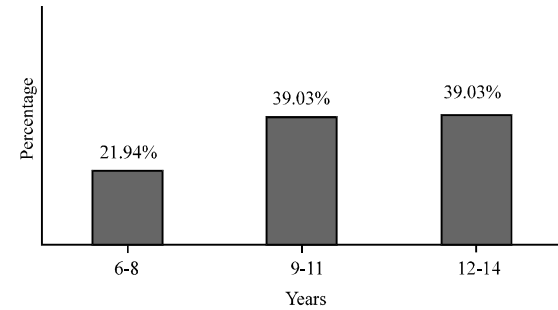


Fig. 4: Distribution of subjects according to age group

Table 1: Frequency of symptoms experienced by the subjects examined

Symptoms	Positives	
	Frequency	Percentage
Itching	128/620	20.64
Abdominal pain	260/620	41.94
Cough	250/620	40.32
Hematury	214/620	34.52
Pain on urination	242/620	39.02
Joint pain	222/620	35.80
Urinary frequency	212/620	34.20

joint pain (35.8%), hematury (34.52%), urinary frequency (34.20%) and itching (20.64%). Among these symptoms, hematury and pain on urination symptoms seem to think straight goals in the presence of urinary schistosomiasis in the medium. Figure 5 theoretically shows the proportions of students infested with schistosomes. Hematury and pain when urinating allowed us to estimate theoretically the overall prevalence of *Schistosoma haematobium* schistosomiasis in between 34.52 and 39.02%. Hematury, considered as a parameter screening of schistosomiasis in *S. haematobium* reveals the proportion of individuals potentially carrying eggs of *Schistosoma haematobium*. The results of microscopic observations of urine samples confirmed the hypothesis that urine containing blood contains schistosome eggs.

Prevalence of urinary schistosomiasis after microscopic examination: Figure 6 shows the proportions of subjects actually infested with schistosome parasites in students

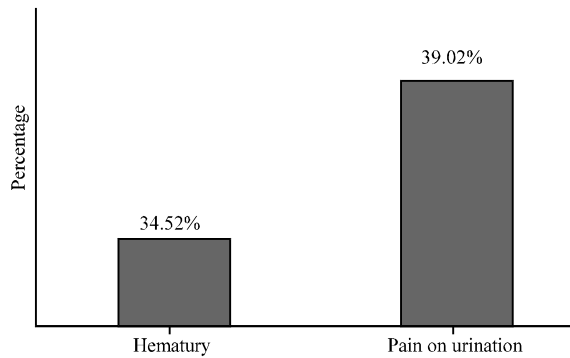


Fig. 5: Hematury and pain on urination among students

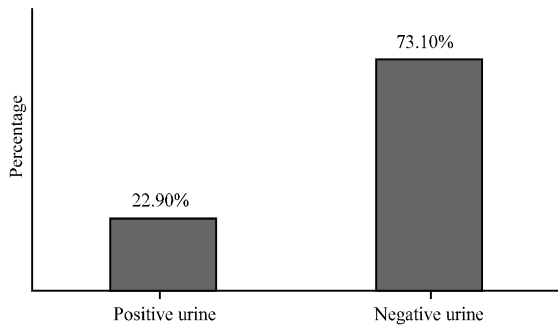


Fig. 6: Microscopic observations of urine samples

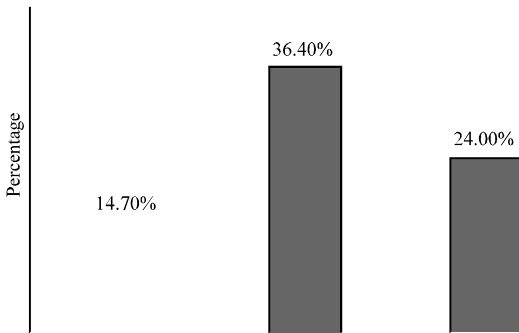


Fig. 7: Breakdown by age of pupils infested with bilharzia

of primary school Maroua. The results obtained after microscopic examination of urine showed that the infected are among 142/620, an overall parasite prevalence of 22.90% of cases of schistosomiasis due to *Schistosoma haematobium*. These results are below those obtained during the interrogation. Nevertheless, the χ^2 -test revealed a significant difference ($\chi^2 = 6.74$, $df = 1$, $p > 0.05$) between hematury (34.51%) and subjects actually infected (22.90%). The distribution by age of students is infested materialized in Fig. 7. Figure 7 shows that the

prevalence of infection with *Schistosoma haematobium* is higher in the age group 9-11 years with a percentage of 36.40%, the average in the age group 12-14 years is 24% and low in the 6-8 years age group 14.70%. Nevertheless, we found that all ages are affected by the infestation of *S. haematobium*. A non-significant difference ($\chi^2 = 11.2$; $df = 2$, $p > 0.05$) among the three age groups was noted. In fact, children whose age ranges between 6-8 years so deserve special attention from parents and have a displacement limited and controlled. This age group is free of many activities at risk of contamination by *Schistosoma*, hence the low prevalence rate. By cons, those in the age group 9-11 years are not easily controlled by parents and are not aware of the risk they run when washing or wading in infested waters furcocercariae. The latter also practice a number of agriculture and fisheries which expose them to infection.

Prevalence of schistosomiasis due to *Schistosoma haematobium* by sex: Prevalence by sex gives 73.50% of boys cons infested 26.50% of girls. There is evidence that boys are more infected than girls. The Chi-square test revealed a significant difference ($\chi^2 = 1.5$, $df = 2$, $p < 0.05$). The difference in prevalence between the sexes could be explained by the fact that generally, African traditional education gives girls and boys of different activities. For reasons of privacy of women, it very difficult to meet girls bathing in rivers or waters unhealthy as would boys.

DISCUSSION

The results of microscopic examination of urinary sediment confirmed the existence of vesicle Schistosomiasis among school pupils in primary schools in the town of Maroua. Ripert *et al.* (1982) in Koza, Yelnik *et al.* (1982) and Wibaux-Charlois *et al.* (1982) in Yagoua have conducted similar studies and have found that urinary Schistosomiasis is endemic in this region plain. Urinary Schistosomiasis is present in the 1960s in northern Cameroon. The average rate of infection was between 15 and 20% but locally, some prevalence reached 50 or even 90% in the Mayo-Danay Division, Logone floodplain (Delas *et al.*, 1968). In February 1984, review of 3533 primary school pupils Yagoua public has established an infection rate of 41.4% for the entire area of Cameroon (Aminou, 1984). Moreover, Granier *et al.* (1985) and WHO (1993a, b) in Mount Mandara and around Maroua and Yagoua also showed rates of urinary schistosomiasis infection due to *S. haematobium* around 40%. Compared to the results, a slight regression of bilharzia *S. haematobium* was observed. The decrease in the

prevalence rate may be justified by the implementation of the awareness campaign and health education of the population, efforts to clean up the city and screening campaigns followed by the free distribution of Praziquantel made by the National Program of Struggle Helminthiasis and Intestinal Schistosomiasis (PNLSHI) and selected NGOs. Njiokou *et al.* (2004) made similar observations noting that urbanization reduces transmission points and the creation of modern water points limits the frequency of human water contacts. The prevalence of infection with *Schistosoma haematobium* is higher in age groups 9-11 years, average age group 12-14 years and lowest in the age group 6-8 years. Traore *et al.* (1990) in two villages in Burkina Faso have conducted similar studies and found that students in age group 10-14 years age group represent the most infested. By cons, Menan *et al.* (1997) in Abidjan, Ivory Coast, in the same situation have obtained rather than the age group of 8-15 is more noisy compared to the age group 3-7 years. The results are closer to the pattern commonly found where there is a peak in the age group 9-14 years and a gradual reduction of the infestation gradually as age increases (Brinkmann *et al.*, 1988; Traore *et al.*, 1990). The decrease in infection rates with age can be explained by the fact that as far as children grow, they become more aware and begin to follow the rules of hygiene. Prevalence by sex showed that male students are more infected than girls. The fact that they are sedentary gives them some compensation to infestation with schistosomes (Raccurt *et al.*, 1987). Similar results were also reported by Traore *et al.* (1990) which underline that the prevalence of schistosomiasis by *Schistosoma haematobium* is significantly higher among boys than among girls. Kassi (1989) explains that boys bathe not only the most frequently in rivers during the rainy season but also help their parents in the work market gardeners who are considered infested environments of schistosomes. Ripert *et al.* (1982) about the breakdown by gender are also finding that boys are more infected compared to girls in rural customary in northern Cameroon.

CONCLUSION

At the end of the investigation on the prevalence of bilharzia in *S. haematobium* in some public schools in the region of Far North Cameroon, we obtained 22.90% of the overall infection rate of schistosomiasis due to *S. haematobium*. Among students infested males is 73.50% against 26.50% in females. It appears from this study that infection with *S. haematobium* depends on several parameters among which researchers mention the socio-economic status of parents, residence and

extracurricular activities of students and age. Given that urinary schistosomiasis is endemic, it is necessary to conduct the fight against this scourge on two levels: prevention and cure of all holders of schistosoma consistently. Among the strategies against urinary schistosomiasis in schools, we propose the following measures: strengthening of school health programs related to schistosomiasis in particular by informing the local population and school officials about the dangers of bilharzia, the PNLSHI double the distribution and administration of praziquantel at the beginning and the end of the rainy seasons.

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APPENDIX

Identification

School name-----
Pupil name-----
Age-----
Sex-----
Class-----
Residence duration-----

Symptoms:

Itching	Yes ?	No ?
Abdominal pain	Yes ?	No ?
Cough	Yes ?	No ?
Urine with blood (Hematury)	Yes ?	No ?
Pain on urination	Yes ?	No ?
Joint pain	Yes ?	No ?
Urinary frequency	Yes ?	No ?

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