

Original Research Article

Presence of an unmapped focus for urogenital schistosomiasis in the Tiko health district in Cameroon: implications for control

Abstract

Schistosomiasis is known to be endemic in all the 10 regions of Cameroon. Urogenital schistosomiasis foci in the South West Region are concentrated in the Meme Division (Nkengazong et al., 2013) and Muyuka Health District, with high prevalence values of 78% (Ntonifor et al., 2012) and 40.27% (Ntonifor et al., 2015). Treatment coverage has been limited to the areas known to be foci for the disease. We studied an area where no infected persons were recorded in the past but recently (June 2017), individuals infected with *Schistosoma haematobium* were identified at a hospital in that area. Demographic, socioeconomic and environmental information were collected via a validated questionnaire. In order to establish the prevalence of, and risk factors for infection with *S. haematobium* in the Tiko health district, urine samples were collected into dry containers from 264 children between the ages of 5 and 20 after administration of structured questionnaires. The samples were preserved appropriately and using the sedimentation technique of microscopy, samples were analysed for the presence of *S. haematobium* ova. It was established that all the subjects had been resident there for at least five years and most, their whole lives. Out of 264 individuals, 101 persons were positive for *S. haematobium*. This gave a prevalence of 38%. The prevalence of schistosomiasis was significantly higher ($p=0.01$) among children aged 5-8 and 17-20 years compared to those aged 9-12 and 13-16 years ($P<0.05$). A very significant difference was also seen in infection between males and females with males having a prevalence of 48% and females having a prevalence of 27%. Multivariate analysis confirmed that using unsafe sources for household chores and drinking water ($P=0.001$), bathing in the stream ($P=0.00001$) and visiting the stream more often ($P=0.0001$) were the key factors significantly associated with schistosomiasis infection among these children. There is obviously an active transmission of urogenital schistosomiasis in the Tiko health district. Since the sedimentation method of diagnosis is less sensitive than the syringe filtration method, which is the gold standard, the prevalence is definitely much higher in this area. The main risk factors that were assessed were actually shown to predispose the individuals to infection. This health district should be included in any future control program in the country which should be integrated.

Key words: Urogenital schistosomiasis, unmapped, focus, active transmission

Introduction

Schistosomiasis has been classified as a neglected tropical disease (NTD). However, its control has gained momentum in the last decade. The disease is endemic in the tropics in Asia, Africa and South America but most of the foci for schistosomiasis fall in sub-Saharan Africa (Adenowo *et al.*, 2015, WHO, 2017). Schistosomiasis is an infection caused by parasitic worms or blood flukes of certain species of the genus *Schistosoma*. Adult parasites live in the blood of mammals, but their life cycle requires a phase of asexual multiplication within a fresh-water snail host. Endemicity depends on the environmental conditions and the existence of the right specie of intermediate hosts (Brown, 1994). Urogenital schistosomiasis usually causes blood and nutrient loss in urine. Research has linked urinary schistosomiasis in Kenyan children to anemia and retarded physical growth (Stephenson *et al.*, 1989). More serious and very common complications include bladder or ureter calcification with an increased risk of bladder cancer (WHO 1985). Though the reduction in morbidity of schistosomiasis by control programmes has been demonstrated (and fortunately no resistance to praziquantel has developed) the morbidity due to schistosomiasis has been shown to be greater than was previously thought (Colley *et al.*, 2017).

Schistosomiasis is a public health problem in Cameroon with 5million people at risk of contracting the disease and about 2million people are infected with the disease comprising mainly of children within the age 5-15yrs who are more vulnerable to this infection (Tchente *et al.*, 2013). Higher transmission rates are registered in the Northern Savannah areas where *S. haematobium* is endemic especially in the Sahel region. In Cameroon, the prevalence of the infection with the fluke in endemic areas is quite significant (Ntonifor *et al.*, 2012, 2015) as a result of failure to develop a national plan for drug distribution over the 10 regions in known foci for the disease. Such a national plan would curb transmission in endemic areas and limit the upsurge of new foci due to migration. The possible methods available to control schistosomiasis have long been recognised as improved water supplies, improved sanitation, snail control, and chemotherapy for infections in the human (and sometimes animal) host (WHO, 1993). Of these, chemotherapy has emerged as the major tool, because of its safe and low-cost intervention producing a rapid impact (WHO, 2012). This notwithstanding, schistosomiasis control has many aspects that must be properly addressed if elimination is envisaged.

The Cameroon government started a national program to control both urinary and intestinal schistosomiasis using the drug praziquantel in 2007. This initiative though successful has not had good coverage due to lack of epidemiological data for the whole nation (Tchente *et al.*, 2013). It appears there are still foci where the intermediate host exists even without apparent infected cases. The displacement (or migration) of individuals into such areas can lead to new areas becoming endemic for the disease. Baseline epidemiological data for every possible focus for schistosomiasis in Cameroon is lacking. During routine hospital diagnosis, four cases were identified with urogenital

schistosomiasis in June 2017 in the CDC Tiko Central hospital. So in March 2018 we sought to establish the fact that there are actually residents in the Tiko health area infected with urinary schistosomiasis and assess the prevalence so as to do a more comprehensive epidemiological survey of the area. The study will enable health policy makers to be informed on the major control method against the disease in this area and educate the inhabitants on its prevention.

Methods

Study area

This study was carried out in the Tiko health district about 20 km from Buea town which is at the foot of Mount Fako. It has a surface area of 4840 square kilometers (sq.km), with a population of 134,649, distributed in 28 villages. Tiko has a population density of 241 inhabitants per sq.km and a population growth of 2.9%. Tiko is 10 meters above sea level at latitude 4°07'N, longitude 9°36'E, with a mean temperature of 27.9°C, relative humidity 83.1% and average rain fall of 4,524 mm. The Likomba community which is part of this health district, has a stream flowing through it known as Ndongo, which is the main source of bathing, household washing and swimming for residents of this area. Most individuals in this community have no access to safe drinking water and proper sanitation facilities. The area is prone to very high average temperatures of about 24-27°C which favour high release of cercariae into the waters. The dry season spans from November to February and the rainy season from March to October and the main occupation here is farming and trading.

Study design

The study was a cross-sectional descriptive study in the month of March 2018 (2weeks), involving children living in the Likomba community. A convenient sampling technique was used to recruit participants into the study. For children less than 13years old assent was gotten from their parents or legal guardians and for those less than 18years old consent was gotten from both the parent and the child. A structured questionnaire was administered to the participants to obtain data on sociodemographic and risk factors of urogenital schistosomiasis. Urine sample collected for the detection of *S haematobium* ova

Data collection

i) Questionnaires

Demographic information including age, sex, level of education, was collected using structured questionnaires which also addressed the possible risk factors to *S. haematobium* in the health district. The Tiko population examined comprised of individuals between the ages of 5-20 years as they constitute the age group that is most susceptible to infection. The sample size was totally 264 and all of the participants responded to the questionnaires. The study participants were interviewed in the language they understood best. Younger children were requested to come along with their parents who helped in answering the questions besides giving their consent.

ii) Urine collection

Each participant who had answered the questionnaire was given a sterile, wide mouthed, screw capped plastic bottle carrying their identification numbers and well instructed on how to collect the urine samples. The younger children, who were 12 years and below collected the urine with the help of their parents. Thus the Urine samples were collected between 10 am – 2 pm daily for 6days. A total of 264 urine samples were collected between, and after exercise to ensure maximum excretion of eggs. The urine samples were then transported immediately to the CDC Tiko central clinic and analysed within two hours of collection. Haematuria was determined by visual observation of urine samples and reagent strips.

Microscopy

The sedimentation technique (Dazo *et al.*, 1974) was used to concentrate the parasite (as this was the technique available in the hospital) for identification under the microscope. 6mls of urine samples were centrifuged at 2000RPM for 5 minutes to obtain sediments, which were then placed on a slide. A drop of iodine was applied to each resulting sediment to ease visibility of the eggs of *S. haematobium* which have a terminal spine and slides view using the X10 objective.

Data analysis

Prevalence of *Schistosoma haematobium* was calculated as the proportion of positive samples. Data collected from the field was presented using descriptive statistics and was entered and analysed using the Statistical Package for Social Scientists (SPSS) version 16. Differences in prevalence of infection among different groups (sex and age), were tested for statistical significance using the Chi-square test. The significance level was set at a p-value of 0.05.

Ethical considerations

This study was carried out with the approval of the Ethical Review Committee on Health Research, regional delegation of Public health for the South West Region Buea, Cameroon. An institutional

ethical clearance was issued by the Biaka university institute of Buea and permission obtained from the District Medical Officer of Tiko subdivision. For children less than 13years old assent was gotten from their parents or legal guardians and for those less than 18years old consent was obtained from both the parent and the child. Informed written consent was obtained from each study participant. Each participant was free to withdraw consent at any time. All personal information of the participants was treated confidentially.

Results

Characteristics of study population

A total of 264 children were screened for urogenital schistosomiasis, out of which 134 (50.8%) were males and 130(49.2%) were females. The children covered only 4 age groups which included 5-8 years, 9-12 years, and 13-16 years and 17-20years. The 5-8 years age group had 77 (29%), 9-12 years age group had 81(30.7%), while the 13-16 years age group had 69 (26.1%) and the 17-20 had 37(14%). Also, a total of 264 questionnaires were administered and all 264 of them responded. One third of the population was from the lower socio-economic group (CDC plantation farmers).

Prevalence of Infection:

The overall prevalence of *Schistosoma haematobium* was 38% (101). The age-related prevalence and sex-related prevalence of urogenital schistosomiasis in the study are presented on table 1 and table 2 respectively. As far as age is concerned, the group with the highest prevalence was the group 17-20 (45.9%) followed by the 5-8 group (40.6%) then the 13-16 group (36.2%) and finally the group 9-12 (34.5%). It was also seen that males recorded a much higher prevalence of 48.5% (65) than females with 27% (36).

Associated risk factors in this Likomba community

The portable water sources in the area are tap water and borehole water but only 140(56%) respondents had one of these two. The rest 124 (44%) used the stream (Ndongo stream) for their domestic activities. The majority (63 out of 101) of those who were infected actually used the stream as a source of water for household chores. It was also seen that those who used the stream as their area of bath had more infected cases than those who took their bath at home. A comparison was also made between those who visited the stream more than twice a day and those who did so less than twice a day. The number of times to visit the stream in a day was also seen as a contributing factor to infection with *S. haematobium* as those who were infected visited the stream for an average of 2.08 times while those who were not infected visited the stream for an average of 1.7 times.

Table 1: Age-related prevalence of children in the Likomba community

Age group (Yrs)	No examined	No infected	Prevalence (%)
5-8	77	31	40.25
9-12	81	28	34.57
13-16	69	25	36.23
17-20	37	17	45.95
Total	264	101	38.26

*** P=0.01

Table 2: Sex related prevalence of children in the Likomba community

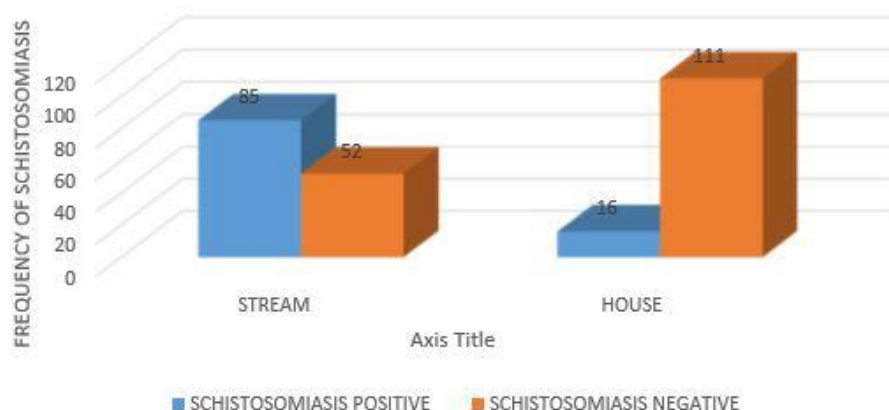
Sex	Number examined	Number infected	Prevalence (%)
Male	134	65	48.5
Female	130	36	27.69
Total	264	101	38.26

***P=0.01

Table 3: Chi-square test: statistical significant difference in prevalence based on risk factors

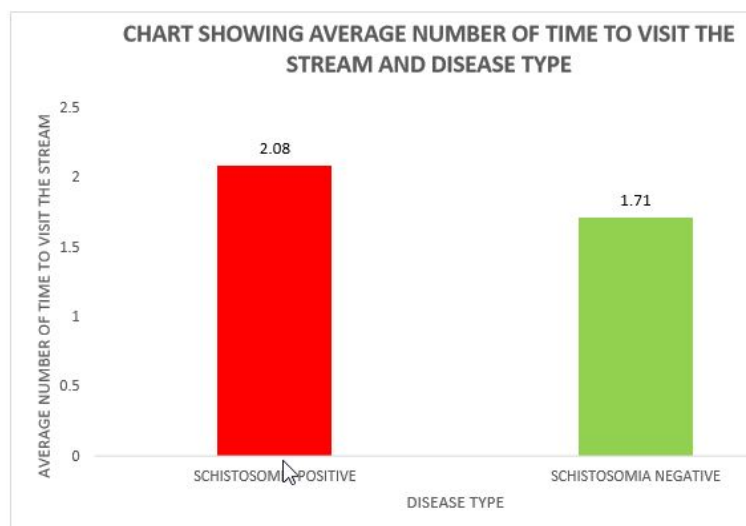
Risk factors	Infected	Non-infected	prevalence	P-value
Source of water				
1. <u>Ndongo</u>	63	61	50.8	0.001
2. <u>Camwater</u>	38	100	27.5	
Point of bath				
1. Stream	85	52	62	0.00001
2. House	16	111	12.6	
Average number of				
<u>times to visit stream</u>	2.08	1.71		0.00001
<u>per day</u>				

CHART SHOWING PREVALENCE OF SCHISTOSOMIASIS BY AREA OF BATH



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174 DISCUSSION

175 Schistosomiasis which is a serious public health problem has not been properly addressed by many
 176 nations in sub-saharan Africa. In Cameroon, control efforts have not been consistent and suffer from
 177 lack of national data on the endemicity and epidemiology of urinary schistosomiasis (as well as
 178 gastrointestinal schistosomiasis). Effective control programs are supposed to create low transmission
 179 areas and if possible zero transmission for the eventual elimination of the disease. None of the control
 180 interventions made so far has created any low transmission area from a high transmission area. In this
 181 study, nobody who had lived in the area for just a year or lesser, was recruited. This was to establish
 182 the fact that only permanent residents were infected and therefore there was an active transmission of
 183 the disease in the area.

As far as the age sub-groups were concerned, there was a significant difference ($p=0.01$) in the prevalence between the groups. The age group 17-20 registered the highest prevalence (45.95%) unlike the study of Ntonifor *et al.*, 2012 where the highest prevalence was in the 9-12 age group. This could be due to the fact that these older children are more involved in doing household chores such as laundry having longer contact time and bathing in the stream than the younger ones. Sex-related prevalence was also seen to be significantly different ($p=0.01$) with the boys having a higher prevalence (48.5%) than the girls (27.69%). Unlike the study of Ntonifor *et al.*, 2012, the boys were more infected and this shows that they are probably more involved in swimming and bathing in the stream which does not have separate points for bathing for girls and boys. As far as risk factors for the disease are concerned, we examined just three namely; source of water for household chores, use of stream for bathing/swimming and frequency of visits to stream in a day. All of these factors were seen to significantly affect infection with the disease. This is worthy of note to future control programs so there can be investment in extending the available pipe-borne water (Camwater) to the whole community.

A total prevalence of 38% was registered which is quite high given that it was the sedimentation technique which was available at the CDC Central hospital, that was used. This technique is known to be less sensitive to the syringe filtration technique, which is used in most epidemiological surveys. In the new focus in the study by Ntonifor *et al.*, 2012, the prevalence was higher and it could be due to the lower socioeconomic status of that village (Munyenge) setting of the study compared to Tiko. Also, the disease may have been endemic in Tiko for a shorter period before this assessment of prevalence, as it was not long ago that reports of cases in the hospital were gotten. It is very probable that the emergence of urogenital schistosomiasis in the Tiko health district is as a result of migration of people from Kumba, Munyenge and Kotto Barombi, which are established foci for *S. haematobium* (Ndamukong *et al.*, 2001, Ndamukong *et al.*, 2006 and Sama *et al.*, 2007), to Tiko due to an on-going crisis in the two English-speaking regions of Cameroon which began in 2016. The movement of people from endemic areas to non-endemic areas where the snail intermediate host is present, may introduce the disease to areas where the disease was absent (Kabuyaya *et al.*, 2017), like many other parasitic diseases, and cannot be prevented. Thus future control efforts in Cameroon must focus on national education as well as education of the local populations, with the goal of breaking transmission. It is true that there may continue to be "silent" epidemiological places which are difficult to trace, avoiding the opportune diagnosis and treatment of infected persons (Noya *et al.*, 2006), but if chemotherapy is used to convert known areas of high transmission to low transmission areas, other interventions like educating the public will eventually break transmission.

Besides periodic drug distribution, health education and community mobilisation, provision of clean and safe drinking water, introduction of proper sanitation are also imperative to curtail the transmission and morbidity caused by schistosomiasis. The government should also equip the

hospitals with better diagnostic equipment like the syringe filters and organise screening campaigns in this area while making available the drug for positive cases. Control against the snail intermediate host should also be considered and it can only be implemented if there is mapping of the snail habitats in Cameroon. Entomological work on the intermediate snail host is necessary in the mapping of all possible foci for schistosomiasis in the country to monitor and control any new foci of the disease. A good knowledge of the snail habitats will direct control efforts to specific locations. This will prevent an up crop of new endemic areas which undermine control efforts made so far.

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