Presence of an Unmapped Focus for Urogenital Schistosomiasis in the Tiko Health District in Cameroon: Implications for Control

Edith Anguh¹,²*, Simon Ako¹,³, Emmanuel Numfor¹, Z. Bimabam Josiah¹ and Vicky Ndassi¹,⁴

¹Department of Allied Health, School of Health Sciences, Biaka University Institute Buea, P.O.Box 77, Buea SWR, Cameroon.
²Department of Parasitology and Microbiology, Faculty of Science, University of Buea, P.O.Box 63, Buea SWR, Cameroon.
³Department of Medical Laboratory Science, Faculty of Health Sciences, University of Buea, P.O.Box 63, Buea SWR, Cameroon.
⁴Department of Zoology and Animal Physiology, Faculty of Science, University of Buea, P.O.Box 63, Buea SWR, Cameroon.

Authors’ contributions

This work was carried out in collaboration between all authors. Authors EA, EN and VN designed the study. Author ZBJ wrote the protocol. Authors EA, SA, EN, ZBJ and VN performed the field and laboratory work. Author EA wrote the manuscript. Authors SA and EN performed the statistical analysis. Author VN supervised the work and revised the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2018/43575

Editor(s):
(1) Dr. Jorge Paredes Vieyra, Universidad Autonoma De Baja California, Campus Tijuana, Mexico.

Reviewers:
(1) Emmanuel Ifeanyi Obeagu, Michael Okpara University of Agriculture, Nigeria.
(2) Ana Julia Pinto Fonseca Siente Afonso, Universidade Nova de Lisboa, Instituto de Higiene e Medicina Tropical, Portugal.
(3) Nishith M. Paul Ekka, Rajendra Institute of Medical Sciences, India.
Complete Peer review History: http://www.sciencedomain.org/review-history/26472

Received 22 June 2018
Accepted 10 September 2018
Published 30 September 2018

ABSTRACT

Background: Schistosomiasis is known to be endemic in all the 10 regions of Cameroon. In the South West Region, it is concentrated in Meme Division [1] and Bafia health area, [2]. Treatment coverage has been limited to the areas known to be foci for the disease. We studied an area

*Corresponding author: Email: ejiwih@gmail.com;
1. INTRODUCTION

Urogenital schistosomiasis, like intestinal schistosomiasis, is a neglected tropical disease and most of the foci for schistosomiasis fall in sub-Saharan Africa [3,4]. However, its control has gained momentum in the last decade (Tcheum Tchuentte, 2012, 2017). It is caused by parasitic flukes of the genus Schistosoma. S. haematobium which is the causative organism for the urinary form of the disease is known to reside in the blood vessels of the bladder and urinary tract, causing serious damage to the tissues of these organs. In endemic areas, the most vulnerable to infection are children between the ages of 5-17 due mainly to the fact that activities like swimming and bathing in streams, bring them into frequent contact with the larval form from the intermediate snail host [5]. In preschool children [6] and school-age children, the chronic form of the disease can lead to anemia, retarded growth, reduced cognitive development (which is known to significantly reduce school performance) and even carcinomas [7,8]. With such serious consequences, there is dire need for stakeholders in the public health sector of endemic countries to implement the already known control measures to curb the rate of infection [9] especially in new foci for the disease. 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 [10].

Schistosomiasis is a public health problem in Cameroon with 5 million people at risk of contracting the disease and about 2 million people infected, mainly children [11]. Higher transmission rates are registered in the Northern Savannah areas where S. haematobium is endemic but generally, the prevalence of the infection in all endemic areas is quite significant [12,2]. This is 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 should reduce the rate of transmission in endemic areas and limit the upsurge of new foci due to migration. This notwithstanding, schistosomiasis control has many other 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 the year 2007. This initiative though successful has not had good coverage due to lack of epidemiological data for the whole nation [11]. 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 diagnoses, four cases were identified with urogenital schistosomiasis in June 2017 in the CDC (Cameroon Development Corporation) 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.

2. METHODS

2.1 Study Area

This study was carried out in the Tiko health district about 20 km from the fastest growing city of Buea 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, it has a relative humidity of 83.1% and average rain fall of 4,524 mm. The area has a mean temperature of 27.9°C which favours high release of cercariae into the waters. 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. The main occupation here is farming and trading.

2.2 Study Design

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

2.3 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 264 and all of the participants responded to the questionnaires. 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 6 days. 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.

2.4 Microscopy

The sedimentation technique [13] 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 sediment to ease visibility of the eggs of S. haematobium which have a terminal spine and slides view using the X10 objective.

2.5 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.
2.6 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 13 years old, assent was gotten from their parents or legal guardians and for those less than 18 years old, consent was sought 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.

3. RESULTS

3.1 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, 13-16 years and 17-20 years. 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).

3.2 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 observed with overwhelming interest that males recorded a much higher prevalence of 48.5% (65) than females with 27% (36).

3.3 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. Again, the assessment glaringly revealed that those who used the stream as their area of bath had more infected cases than those who took their bath at home. In addition to the above, a comparison was done between those who visited the stream more than twice a day and those who did so less than twice a day; this was to ascertain the possible likelihood that the number of times to visit the stream in a day could also be endorsed as a contributing factor to infection with S. haematobium. Hence, it was remarkably observed that 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.

4. DISCUSSION

Emphatically speaking, it is worth noting that Schistosomiasis which is a serious public health problem has not been properly addressed by many nations in Sub-Saharan Africa. In Cameroon, control efforts have not been consistent to a satisfactory level. Moreover, the absence of national data on the endemicity and epidemiology of urinary schistosomiasis (as well as gastrointestinal schistosomiasis) poses a more serious problem for the assessment of progress in control programs. Effective control programs are supposed to create low transmission areas and if possible zero transmission for the eventual elimination of the disease. None of the control interventions made so far has created any low transmission area from a high transmission area. In this study, nobody who had lived in the area for just a year or lesser was recruited. This was to establish the fact that only permanent residents were infected and therefore there was an active transmission of 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 (45.9%) unlike the study of Ntonifor et al. [12] and Mewabu et al. [14] where the highest prevalences were in the 9-12 and 10-13 age groups respectively. 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. [12], but similar to others [15,14] the boys were more infected than the girls. This shows that they are probably more involved in swimming and bathing since the stream has separate points for bathing for girls and boys; which may have been a restricting factor especially for the girls. 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 not only worthy of note, but also necessitates proper attention for future control programs; so there can be investment in extending the available pipe-borne water (Camwater) to the whole community.

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

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Number examined</th>
<th>Number infected</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-8</td>
<td>77</td>
<td>31</td>
<td>40.25</td>
</tr>
<tr>
<td>9-12</td>
<td>81</td>
<td>28</td>
<td>34.57</td>
</tr>
<tr>
<td>13-16</td>
<td>69</td>
<td>25</td>
<td>36.23</td>
</tr>
<tr>
<td>17-20</td>
<td>37</td>
<td>17</td>
<td>45.95</td>
</tr>
<tr>
<td>Total</td>
<td>264</td>
<td>101</td>
<td>38.26</td>
</tr>
</tbody>
</table>

*Chi-square test p=0.01

Table 2. Statistically significant differences in prevalence based on risk factors ($\chi^2$ test)

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Infected</th>
<th>Non-infected</th>
<th>Prevalence</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of water</td>
<td></td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>1. Ndongo stream</td>
<td>63</td>
<td>61</td>
<td>50.8</td>
<td></td>
</tr>
<tr>
<td>2. Camwater</td>
<td>38</td>
<td>100</td>
<td>27.5</td>
<td></td>
</tr>
<tr>
<td>Point of bath</td>
<td></td>
<td></td>
<td></td>
<td>0.00001</td>
</tr>
<tr>
<td>1. Ndongo stream</td>
<td>85</td>
<td>52</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>2. House</td>
<td>16</td>
<td>111</td>
<td>12.6</td>
<td></td>
</tr>
<tr>
<td>Average number of times to visit stream per day</td>
<td>2.08</td>
<td>1.71</td>
<td>0.00001</td>
<td></td>
</tr>
</tbody>
</table>

Fig 1: Differences in the number of schistosomiasis-positive and schistosomiasis-negative individuals depending on where they take a bath regularly.
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. [12], 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* [16,17,18], to this area. This mass migration is due to an ongoing crisis in the two English-speaking regions of Cameroon which began in October 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 [19], like many other parasitic diseases, and this movement 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 [20]. However, 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. Most importantly, the control against the snail intermediate host and access to treatment should also be considered by stakeholders. This can only be implemented if there is mapping of the snail habitats in Cameroon. A good knowledge of the snail habitats will direct control efforts to specific locations. This will prevent an outcrop of new endemic areas which will undermine past control efforts.

5. CONCLUSION

From the findings of this study, it is obvious that there is an active transmission of urogenital schistosomiasis in the Tiko health district. The factors significantly associated with schistosomiasis infection among these children were; bathing in the stream, visiting the stream more often and using unsafe sources for household chores and drinking water. The provision of clean and safe drinking water, community health education and the distribution of praziquantel in this health district will help curb the spread of the disease and reduce the disease burden. Finally, better methods for diagnosis should be provided to the health establishments to ensure proper diagnosis of infected people in this health district.
CONSENT

As per international standard or university standard, patient’s written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

ACKNOWLEDGEMENTS

The authors are grateful to the Chief of Likomba and to the 12 Quarter Heads and their subjects who participated in the study. Laboratory space and equipment was provided by the CDC Tiko Central Hospital laboratory and staff, for which the authors are most grateful. We are also grateful to the reviewers for their time and constructive criticism that has helped to enrich the manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


14. Mewabo AP, Moyou RS, Kouemeni LE, Ngogang JY, Kaptue L, Tambo E. Assessing the prevalence of urogenital


© 2018 Anguh et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/26472