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Prevalence of *Shistosoma haemotobuim* Infestation in Children Aged 4 to 15 Years in the Locality of Matta Barrage of Cameroon

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Abstract: Schistosomiasis is an acute and chronic parasitosis caused by worms (trematodes) of the genus Schistosoma. Infection in humans occurs when parasite larvae, released by freshwater gastropods, enter the skin through contact with infested water. Schistosomiasis is most prevalent in tropical and subtropical regions, particularly in poorer communities with no access to drinking water or adequate sanitation. Lack of hygiene and contact with contaminated water make children particularly vulnerable to infection. The aim of this study was to determine the prevalence of *Shistosoma haemotobuim* infestation in children aged 0-4 to 15 years in the locality of Matta-barrage. Microscopy using the sedimentation technique was used to identify *Shistosoma haematobuim* eggs in collected urine samples. Observation with a binocular magnifying glass was used to assess the cercarial emission rate**.** Of 155 urine samples analyzed, 69 were positive, representing a prevalence of 44.52%. The rate of Shistosoma haemotobuim cercariae was 21.03%. The prevalence of urogenital schistosomiasis is very high in this locality of Matta Barrage, as is the rate of cercarial transmission. A deworming campaign with Praziquantel is more than necessary.

Keywords: Prevalence, *Shistosoma haemotobuim*, Children Aged 4-14 Years

1. Introduction

According to the World Health Organization, schistosomiasis is an acute or chronic parasitosis caused by trematode flatworms of the genus Schistosoma [1]. The parasites responsible for the disease have a complex evolutionary cycle involving both intermediate and definitive mammalian hosts, which are freshwater molluscs and humans. The parasite cannot be transmitted directly from one person to another; it passes through intermediate host mollusc species (gastropods) that live and reproduce in freshwater. Molluscs are therefore crucial to the evolutionary

cycle of schistosomes, and proliferation and transmission depend on these hosts [3]. Schistosomes are haematophagous, sex-separated trematodes that live in the circulatory system of their host (humans), with a reproductive cycle of complex [2]. Bilharzia it is endemic in 76 countries worldwide with more than 206.5 million people infected; school-age children are generally the most affected among populations. In 2018, WHO estimated that the number of school-age children with schistosomiasis was 124.4 million in 52 countries alone, representing 54.2% of all people with the disease worldwide [8]. Urogenital schistosomiasis is known to cause hematuria, dysuria, nutritional deficiencies, bladder cancer risk and stunted growth in school-age children. Projects involving water resources for electricity generation and irrigation have caused a huge increase in transmission worldwide and outbreaks of schistosomiasis in several African countries [8]. Schistosomiasis in Cameroon mainly affects school-age children. The development of dams for hydroelectric power, irrigation canals and the lack of drinking water are among factors that have greatly contributed to the high prevalence of schistosomiasis in the country. In 2017, a study was carried out in Cameroon in the same locality showed a 41.1% prevalence of the disease among school-age children [5]. The main objective of this study was to determine the prevalence of *Shistosoma haemotobuim* infestation in children aged 04 to 15 years in the locality of Matta-barrage and to evaluate the cercarial emission rate.

2. Materials and Methods

This is a case-control study, which lasted 5 months (July to November 2020) in the locality of Matta barrage. Three neighbourhoods were involved: Kotoko, Bororo and Arab. The sample size was calculated using the Lorenz formula. Data collection tools consisted of pre-established forms. Urine was collected in sterile, labelled bottles. Collection took place between 10 a. m. and 2 p. m., when urine is rich in schistosome eggs. Analyses were carried out in the laboratory by microscopy using the sedimentation technique. For the cercarial emission assessment, the species concerned by this study were selected according to the description established by Brower Kristensen in 1993. the molluscs were placed in plastic bags half-filled with water from the area. They were then exposed to the sun for 2 hours, and each pillbox was examined under a binocular magnifying glass to determine the presence or absence of cercariae. Molluscs emitting cercariae were isolated and then counted to assess the natural infestation rate of each population.

3. Results

3.1. Sociodemographic Data

During the collection period, we sampled 155 participants. The largest number of subjects in our study were male (88), i. e. (57%), and the smallest number (67) were female, i. e. (43%). The sex ratio (M/F) was 1.31 men to women. The average age of our participants was 7.49 years, with a high representation in the age groups [figure 1] (45.2%), (31.96%), (14.19%) and (9.67%). The maximum age of the participants was 15 years, whereas the minimum age of the population was 4 years (see figure).

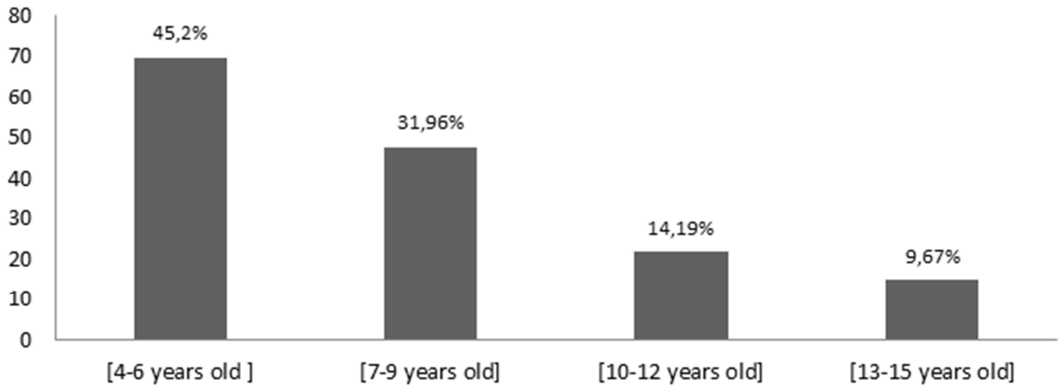

Figure 1. *Number of participants by age group (Ans).*

The figure shows the number of participants by age group. The 4 to 6 and 7 to 9 age groups are the largest in our study.

3.2. Biological Data

3.2.1. Prevalence of Urinary Schistosomiasis

The subjects examined in this study ranged in age from 04 to 15 years. 155 urine samples were collected. Our analysis of the samples revealed that 69 participants had urogenital schistosomiasis, i e. an overall prevalence of 44.52%, with infestation levels ranging from 1 to 725 eggs/50µL of urine pellet, and haematuria in almost 33% of infested subjects. Among the 69 participants infested by the disease, we observed during our analyses that 39/69 were male, i e. a prevalence of 56.52%, and 30/69 were female, i e. a representation of 43.48%.

3.2.2. Prevalence by District

We visited three (3) neighborhoods in the Matta-barrage village, including the Arab, Bororo and Kotoko neighborhoods. Prevalence varied from one district to another. Of the 155 samples collected, 69 were positive, including 26/75 in the Arabe district, i e. a prevalence of

34.66%, 6/16 in the Bororo district, i e. a prevalence of 37.5%, and 37/64 in the Kotoko district, i e. 57.81%.

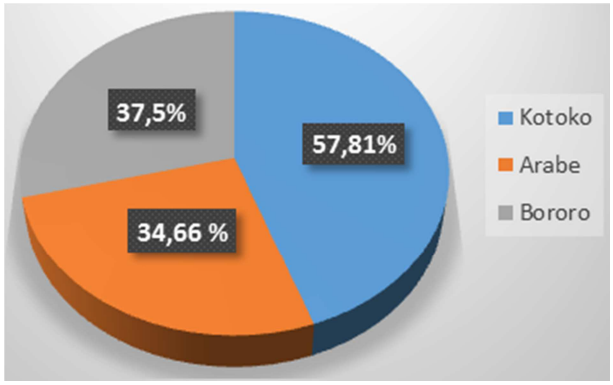

Figure 2. *Prevalence of urogenital bilharziasis in children aged 04 to 15, by district.*

Figure 2 shows that the participants most affected by schistosomiasis are those in the Kotoko district.

3.2.3. Distribution of Schistosomiasis Prevalence by Age Group

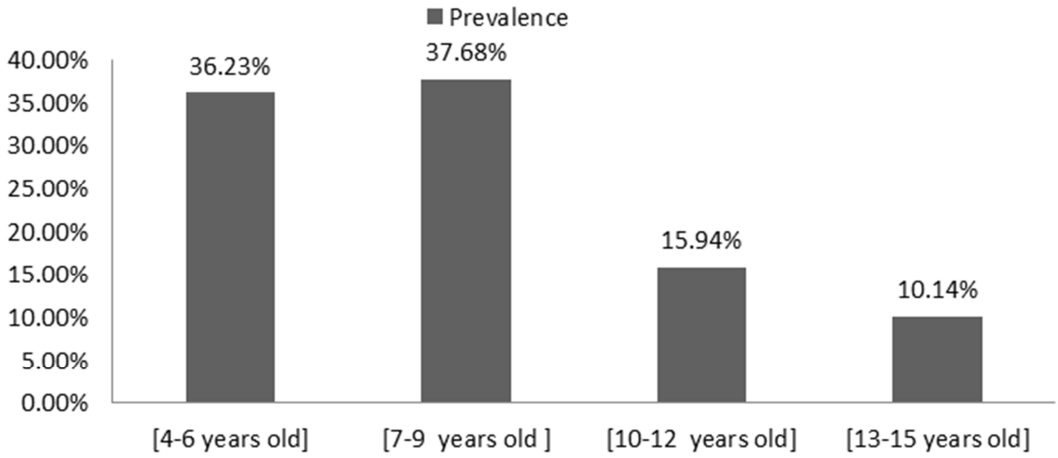

Figure 3. *Distribution of schistosomiasis prevalence by age group.*

The figure shows that the two age groups (4-6 and 7-9) have the highest prevalences among participants.

3.2.4. Assessment of Cercarial Emission Levels

Once in the laboratory, the molluscs were placed in plastic containers half-filled with water from the harvesting area and fed fresh lettuce leaves. The rearing water was replaced each time to avoid putrefaction of the medium, which could lead to death from hypoxia. The molluscs were placed individually in pillboxes containing spring water and exposed to daylight for two (2) hours of renewable time to stimulate cercarial emission. Each pillbox is examined under a binocular magnifying glass to detect cercariae. Naturally infested molluscs emitting cercariae are isolated and counted to assess the natural infestation rate of each population. For counting, 10 milliliters of water containing cercariae were pipetted out of the cercariae-emitting medium and placed in a petri dish with a grid pattern to delimit the counting fields; a few drops of lugol were added. Leave for 10 minutes, then observe the preparation under a binocular magnifying glass. The colored cercariae appear glistening blue. Cercaria colored in this way are easy to count (PAGÈS and THÉRON, 1990).

3.2.5. Results of Cercaria Emission Tests

Table 1. *Distribution of molluscs according to emission test results at site 1 (Barrage) by time of day.*

Mollusc species (*Bulinus truncatus*) Number Emission rate	**Number of molluscs tested**	**Emission rate**
Number of individuals tested	195	14,87%
Number of molluscs transmitting *Shistosoma haematobuim* cercariae	13	6,66%
Number of cercariae-transmitting molluscs of other species	10	05,12%
Number of molluscs transmitting cercariae of *Shistosoma haematobuim* and other species	06	03,07%

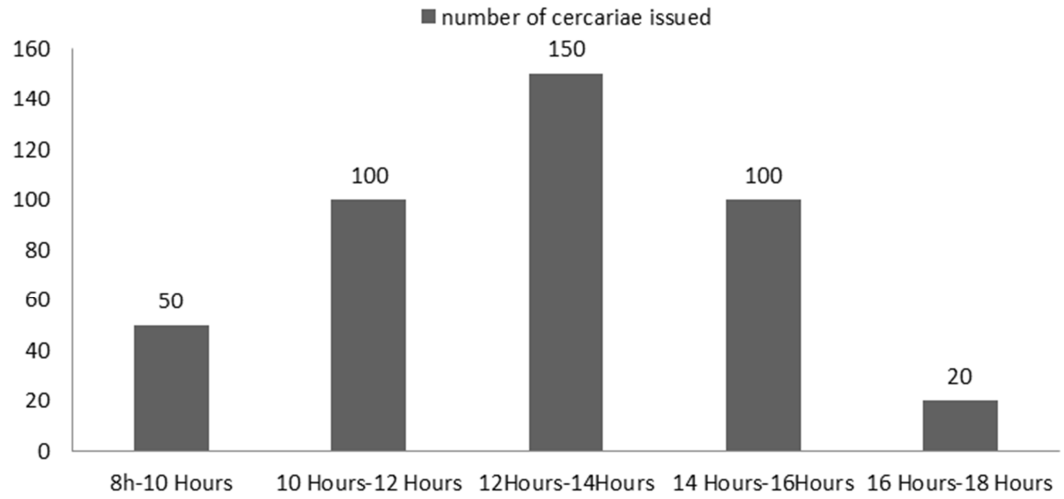

Figure 4. *Cercaria emission tests per hour.*

The figure shows the results of the cercaria count as a function of the time of exposure. It also shows that, in contrast to the other time intervals, cercaria emissions are very high at 12:00-14:00.

Table 2. *Distribution of molluscs according to emission test results at site 2 (Dam), by time of day.*

Mollusc species (*Bulinus truncatus*) Number Emission rate	**Number of molluscs tested**	**Emission rate**
Number of individuals tested	195	35,38%
Number of molluscs transmitting *Shistosoma haematobuim* cercariae	41	21,03%
Number of cercariae-transmitting molluscs of other species	18	09,23%
Number of molluscs transmitting cercariae of *Shistosoma haematobuim* and other species	10	05 13%

The figure shows the results of the cercariae count as a function of the time of exposure, and goes on to show that unlike the other time intervals, cercariae emission is very high at 12:00-14:00.

4. Discussions

The prevalence of urogenital schistosomiasis (Matta-barrage) observed in this study was 44.52%, showing a hyperendemicity of urinary schistosomiasis in the locality. This prevalence corroborates the WHO classification of 40.1-68.2% [1]. Our overall prevalence is not far from that obtained by Ntonifor and that reported in other households in the South-West region: 40.27% in Munyenge (Ntonifor, Green, Bopda, & Tabot, 2015), 41.1% in Matta-barrage, Matta-village and ile and 41.3% in Marumba (Nkengazong, Njiokou, Teukeng, Enyong, & Wanji, 2009). On the other hand, it is much higher than previous prevalences obtained in other localities in the West Region and in other regions of Cameroon: 1.7% in Kékem [11]. These areas have been regularly targeted for schistosomiasis and geohelminth control, which could explain the lower reported prevalence of schistosomiasis. Another possible reason for the lower prevalence of schistosomiasis observed in these studies compared to the current study could be differences in geographical settings; these studies were carried out in urban and semi-urban settings, whereas the current study was carried out in rural settings. A higher prevalence of schistosomiasis in rural areas has also been reported in other parts of the country [10]. As indicated by Njiokou in 2004, urbanization reduces transmission points and the creation of modern water points limits the frequency of human contact with water. Prevalence by district was very high in the Kotoko district (57.81%), and lower in the Arab district (34.66%) and the Bororo district (37.5%). This could be explained by the fact that the inhabitants of the Kotoko district of Matta-barrage are mainly involved in fishing, which brings them into daily contact with water, exposing them more to infection than other residents. Prevalences by age group were higher in the [4, 6] age group (36.23%) and the [7, 9, 10] age group (37.68%).

In this study, schistosomiasis was more prevalent in boys. The higher prevalence in boys (25.16%) could be attributed to higher patterns of water contact through swimming, playing, fishing and participation in other activities such as making burnt bricks along infested bodies of water, in addition to the primary domestic activities of washing and collecting water, which expose both sexes to infection. The finding of a higher prevalence of schistosomiasis in boys in this study is similar with other studies that have been carried out elsewhere.

The difference may be attributed to the fact that boys compared to girls are the ones who frequently come into contact with infested water either while playing, swimming or fishing in this study. With regard to the cercariae emission test results, the population density observed in site 1 was lower than in site 2. This may be due to the nature of the substrate: sand and gravel in site 1 and mud in site 2 [11, 12]. The presence of sand and gravel is not conducive to the development of abundant vegetation, which would serve as

food for the molluscs. In site two (2), the muddy substrate favours the development of peri-aquatic vegetation.

Abundant and numerous Nymphaea lotus (an aquatic plant on which molluscs feed) from which we collected a large number of freshwater molluscs during our study. Although site 1 is more frequented by humans than site 2, the cercariae emission test revealed a higher prevalence in site 2. This could be explained by the fact that site 1, being open (circulating water and large expanse), offers more opportunities for miracidiums to move around, thereby reducing their probability. The dyke upstream of site 2 and the small bridge beside it prevent water circulation, making site 2 a small, permanent pool, reducing water movement and increasing the likelihood of miracidiums encountering a compatible freshwater mollusc. In addition, the intense household activities (laundry, washing up, improvised washing of motorcycles, etc.) observed on site 1, with the abundant use of detergents, could have a detrimental effect on the survival of miracidiums in the water.

5. Conclusion

This study shows that the high prevalence and carriage of S. haematobium eggs in children aged between 04 and 15 is related to their vectorial capacity. It also shows that, in contrast to the other time intervals, cercariae are emitted at a very high rate between 12 and 14 hours. To effectively control disease transmission in the area, it will be necessary to limit contact with dam water, eliminate the intermediate snail host, educate the population and administer praziquantel en masse to the entire population of Matta-Barrage, Matta-village and the islands.

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