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PREVALENCE OF *SCHISTOSOMA* CERCARIAE IN SNAIL VECTORS IN NTAWOGBA CREEK, PORT HARCOURT, RIVERS STATE, NIGERIA

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Abstract
The prevalence of *Schistosoma* cercariae in snail vectors in Ntawogba Creek, Port Harcourt, Rivers State, Nigeria was investigated. Snail samples were collected from the bank of the creek using a long frying spoon and an improvised scoop net with a long wooden handle. Snails attached to vegetation and other substrata were hand-picked. Collected snails were counted and identified based on structural and morphological features of the shell and investigated for the presence of cercariae using the light exposure method. The snails were later crushed and the parasites concentrated using zinc sulphate flotation technique. A total of 118 snail samples were collected out of which 115(97.5%) and 3(2.5%) belong to two genera, *Bulinus* and *Oncomelania* respectively. A prevalence of 29(24.6%) was recorded. Out of the 115 snails *Bulinus* species, 26(22.6%) were positive for the presence of *Schistosoma* cercariae while all the 3 *Oncomeania* species were positive 3(100%). Out of the 75 cercariae shed by the snails, 65(86.7%) were shed by *Bulinus* sp while 10(13.3%) were shed by *Oncomelania* sp. The study established the presence of a snail intermediate host of *Schistosoma* spp. shedding cercariae in the study area. Deliberate health orientation of the people, provision of potation water to prevent the use of the creek as a source of water, and good sanitary habit will go a long way to prevent a possible increase in the prevalence of the infection.

Keywords: *Schistosoma* spp., Cercariae, Snail intermediate host, Ntawogba creek, Port Harcourt.

Introduction

Human schistosomiasis is a major parasitic disease caused by a blood-dwelling trematode of the genus *Schistosoma*. Although five species of *Schistosoma* are pathogens of man (Ross et al., 2007; Gryseels et al., 2006), only three major species are reportedly common: *Schistosoma haematobium* which infects the urinary system resulting in urinary schistosomiasis, *S. mamsoni* and *S. japonicum* which are parasites of the gastrointestinal tract and liver causing intestinal schistosomiasis (WHO, 2021). The infection is one of the Neglected Tropical Diseases (NTDs) ravaging many poor countries of the world. WHO (2020) reported that more than 700 million people live in schistosomiasis-endemic regions and an estimated 240 million people are infected by the disease globally. In 2018, CDC (2018) recorded that schistosomiasis infected as many as 200 million people, second only to malaria as the world's most devastating parasitic illness. In 2019, WHO (2021) recorded that 236.6 million people needed preventive treatment for schistosomiasis out of which an estimated 105.4 million people were treated. At least 90% of people in need of this treatment live in Africa (WHO, 2021).

In 2012, Nigeria had the highest occurrence of Schistosomiasis globally (Hotez, et al., 2012), with an estimated 29 million people at risk of the infection, out of which an estimated 16 million were children (Adenowo, et al., 2015; WHO, 2013). Designated as the number two most devastating parasitic disease behind malaria (CDC, 2018), schistosomiasis has been implicated in serious cases of morbidity in several studies carried out in Nigeria and other African countries (Umoh, et al., 2020; Abdulkareem, et al., 2018; Akinneye, et al., 2018; Dawaki, et al., 2016; Kumbu,

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et al., 2016; Dawaki, et al., 2015). The disease is associated with poor sanitation and lack of safe drinking water. These conditions exist in developing countries of the world; hence, schistosomiasis is prevalent in these areas. People become infected when they come in contact with freshwater contaminated with the larvae of these parasites. The medicine praziquantel is now the main therapeutic option, and while it is effective against adult worms at large doses, it is ineffective against immature worms, necessitating recurrent treatment.

The intermediate host of *Schistosoma sp.* are various species of freshwater snails of the genera *Biomphalaria, Oncomelania* and *Bulinus* which harbor *S. mansoni S. japonicum* and *Bulinus* respectively (CDC, 2019). Several researchers have investigated the density of the snail host in Nigeria (Amawulu & Ndubuisi, 2021; Abubakar, et al., 2019; Amawulu, et al., 2018; Obisike, et al., 2018; Olorunniyi & Olofintoye, 2017; Ngele, et al., 2012). Again, there are few studies to assess the prevalence of schistosomiasis in Rivers State (Elele et al., 2020; Goodhead & Dirisu, 2016; Abah et al., 2016). There are so many anthropogenic activities along the Ntawoba creek in Port Harcourt yet no scientific study to evaluate the occurrence of snail host of schistosomiasis in the creek. This study is therefore aimed at evaluating the prevalence of snail hosts of schistosomiasis in Ntawoba creek, Port Harcourt, Rivers State. The larvae pierce the skin of humans, mature within the blood arteries of the body, and deposit eggs that become trapped in the tissues. The body's reaction to these eggs produces irritation and impairment of the liver, lungs, gut, and bladder, among other organs. Rashes, fever, myalgia, respiratory problems, widespread illness, and death are some of the indications. Anemia, malnutrition, and learning impairments can occur in children who are frequently infected. Because the parasite is transmitted through faecal or urine contamination of freshwater containing intermediate host snails, as well as cutaneous contact with the same water, sanitation, hygiene, and water sources all play a part in the parasite's transmission.

Materials and Methods

Study Area: This study was carried out along Ntawogba creek (Fig. 1.0). The creek is characterized by a single channel flowing downstream with a low gradient (Amangbara and Gobo, 2007). It is located on the west of Port Harcourt metropolis and lies between latitude $4^{0}55'$ and longitude $6^{0}58'$(Gobo & Abam, 2006). The creek crisscrosses several communities in Obio/Akpor and Port Harcourt Local Government Areas, flowing from Rumueme and Rumueprikom in Obio/Akpor Local Government Area through Diobu and empties into the Amadi creek in Port Harcourt Local Government Area.

Sample Collection: Five designated points based on human activities, were selected along the creek for snail collection. Snails were sampled from the sides of the flowing stream along the Ntawogba creek using a long frying spoon and an improvised scoop net with a long wooden handle. Some snails attached to vegetation and other substratum were also hand-picked wearing a pair of gloves.

A total of 118 snail samples were collected from various points along the creek. The snails collected were sorted from the debris using forceps and stored temporarily in a clean plastic jar filled with fresh water from the creek. For laboratory evaluation, they were taken to the research laboratory of the Department of Biology at the Ignatius Ajuru University of Education in Rivers State. The snails were collected within August and November 2021.

Laboratory examination: The snails were counted and identified in the laboratory-based on structural and morphological features of the shell using standard identification keys (Brown, 1994., WHO, 1998). The snails were checked for cercariae belonging to the *Schistosoma* genus. using the light exposure technique by placing each of the snails in the well-labeled individual plastic vial and exposing them to bright light from a two hundred watts (200w) electric bulb for 1 hour (Wolmarans et al., 2002). This technique induces the shedding of cercariae from the snails (if present) and the water examined under a microscope. The snails were later crushed and concentrated using the zinc sulphate flotation technique (Cheersbrough, 2005).

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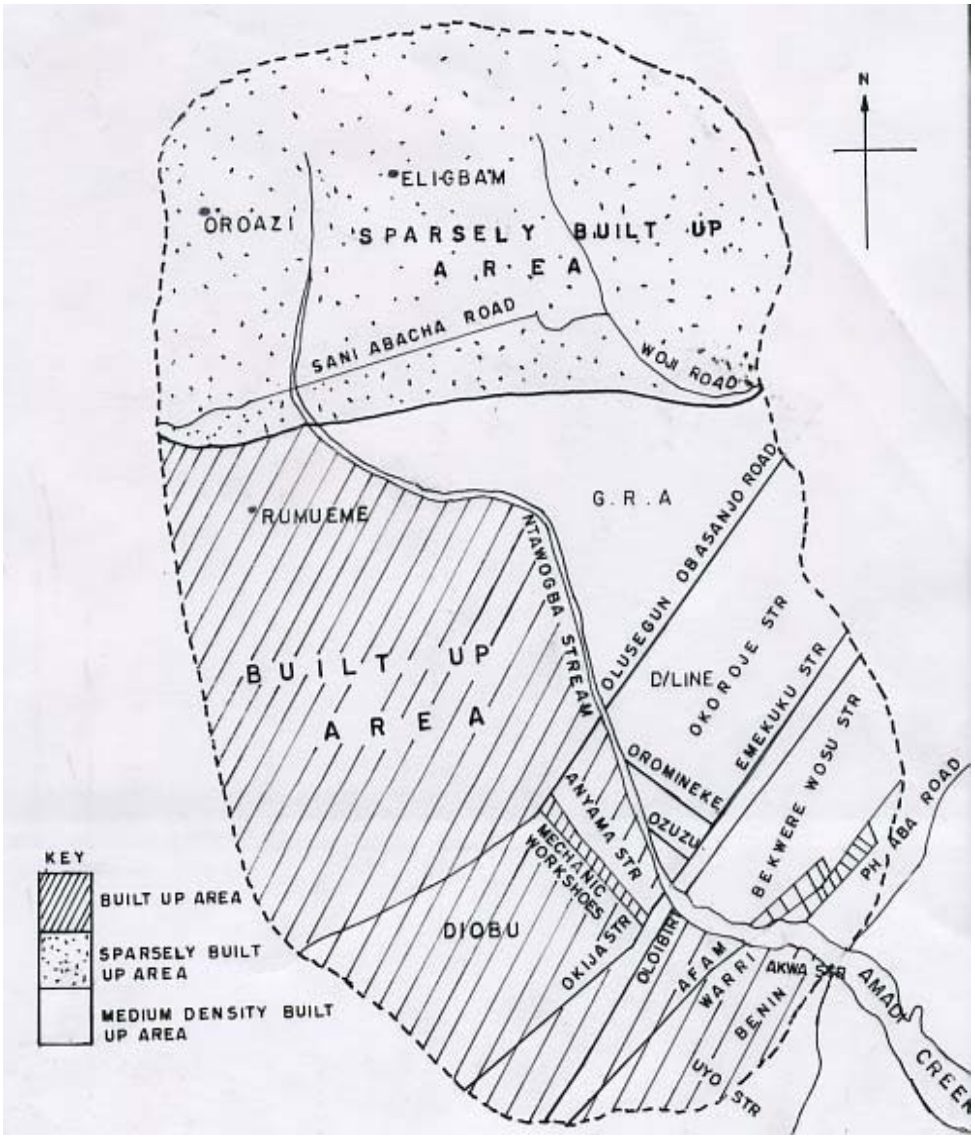

Fig. 1.0: Map of Port Harcourt showing the Ntawoba creek
Source: Amangabara & Gobo (2007)

Data Analysis: SPSS version 23 was used to analyze the data. At a significance threshold of 0.05, the T-test was performed to evaluate the significant difference between variables. The parasite's mean intensity was calculated using the formula below.

$$\text{Mean Intensity of parasite} = \frac{\text{No. of parasites}}{\text{Samples infected}}$$

Results

Collection of snail: A total of 118 snails were collected from the selected sites along the creek. The results indicated that out of the 118 snail samples collected from the creek, 115(97.5%) and 3(2.5%) species belong to two genera, *Bulinus* (Plate 1.0) and *Oncomelania* (Plate 2.0) respectively (Fig, 2.0).

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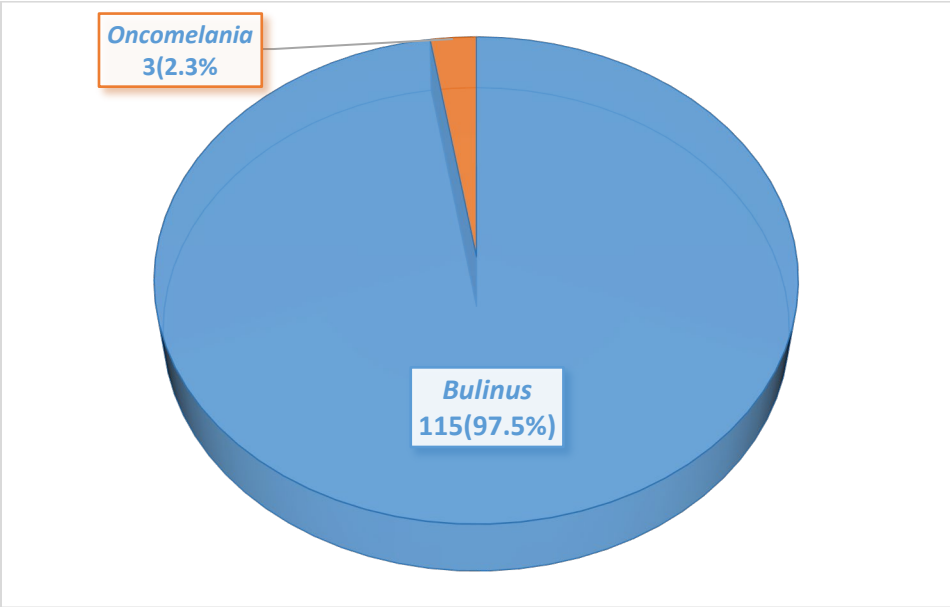

Fig. 2.0: Distribution of genera collected from Ntawogba creek

Plate 1.0: Snail samples belonging to the genus *Bulinus* collected from the study area

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Plate 2.0: Snail samples belonging to the genus *Oncomelania* collected from the study area

Prevalence of cercariae in snail: A total of 118 freshwater snails belonging to two genera were identified. Out of the 115 snails belonging to the genus *Bulinus*, 26(22.6%) were positive for the presence of *Schistosoma* cercariae all the 3 snails belonging to the genus *Oncomeania* were positive 3(100%). The study recorded an overall prevalence of 29(24.6%) (Table 1.0).

Table 1.0: Prevalence of *Schistosoma* cercariae in snails sampled from Ntawogba creek

			Prevalence of parasite		
			Infested	Not Infested	Total
Fresh Water Snail	Bulinus	Count	26	89	115
		%within Fresh Water Snail	22.6%	77.4%	100.0%
	Oncomelania	Count	3	0	3
		%within Fresh Water Snail	100.0%	.0%	100.0%
Total		Count	29	89	118
		%within Fresh Water Snail	24.6%	75.4%	100.0%

Mean intensity of the parasite: A total of 75 *Schistosoma* cercariae were shed by snails exposed to light within the specified time. The cercariae were counted, out of which 65(86.7%) were shed by *Bulinus* sp while 10(13.3%) were shed by *Oncomelania* sp (Table 2.0)

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Table 2.0: Mean intensity of cercariae shed by snail intermediate hosts

Snail	No. Examined	No. infected(%)	Schistosome counted	Mean Intensity
Bulinus sp	115	26(89.7)	65(86.7)	2.5
Oncomelania sp	3	3(10.3)	10(13.3)	3.3
Total	**118**	**29(24.6)**	**75**	

$p < 0.05$

Discussion

Schistosomiasis is a serious health burden globally, especially in Africa where poor sanitation, lack of good drinking water, poor personal hygiene, and poverty still exist. In this study snails belonging to two genera, *Bulinus* and *Oncomelania* were identified. This result is contrary to the results recorded by Awi-Waadu et al. (2020), Maurice et al (2019), Peletu et al. (2019), and Oloroniyi and Olofintoye (2017). A study by Awi-waadu et al. (2020) recorded the absence of *Bulinus* in the Port Harcourt metropolis. Ayande (2009). Oloroniyi & Olofintoye (2017) recorded three genera of fresh water snails (*Potadoma moerchi*, *Lanites libycus* and *Bulinus globosus*) in Ekiti State. Besides *Bolinus,* other snail genera are not known vector of *Schistosoma*. Ayande (2009) recorded *Bulinus globosus* and *Biomphalaria preifferi in* two locations in Ahmadu Bello University in Kaduna, Nigeria. Peletu et al. (2019) also identified *Bulinus globosus* and *Biomphalaria preifferi* in Aponmu-Lona River basin in Ondo State, Nigeria, Maurice et al. (2019) recorded *Lymnaeid, Biomphalaria, Bulinus, Oncomelaniae* and *Melanoides* in an agro-ecological zone in western Kenya while Yirenya-Tariah et al. (2011) recorded the presence of *Bulinus truncalus, Bulinus globosus, Biomphalaria preifferi, Pila spp., Melanoides spp.* And *Physa waterlotii* in Kpong head pond, Ghana. The difference in the results may be due to anthropomorphic and environmental influences on snail distribution (Krauth et al., 2017). Ntawogba creek crisis crosses several residential areas (communities) and there are so many human activities along the bank of the stream including automobile repairs, direct defecation, dumping of refuse, bathing, and hawking. These activities might have influenced the physicochemical properties of the creek which invariably affect the distribution of the snail species in the creek.

The identification of *Bulinus sp* and its high prevalent rate agreed with the results recorded by Maurice et al. (2019), Peletu et al. (2019), Ayande (2009) and Oloroniyi and Olofintoye (2017). All the authors recorded the presence of *Bulinus* in the study areas investigated. However, the 22.6% recorded in our study is lower than the 71.1% by Yirenya-Tawiah et al. (2011) but higher than the 1.86% by Peletu et al. (2019). *Bulinus* sp. is the intermediate host of *Schistosoma hematobium* and the high prevalence of the parasite in Ntawoba creek is an indication of potential danger for the spread of urinary schistosomiasis. Incidentally, during sample collection, many people especially artisans were seen passing out urine and defecating into the creek.

The presence of *Oncomelania* sp. agrees with the record of Awi-Waadu et al. (2020). However, the prevalence rate (10.3%) recorded in this study is higher than the 1.60% recorded by Awi-Waadu et al. (2020). This is an indication that certain factors are encouraging the survival or striving of the snail species in the study area.

Conclusion

The results of the study established the presence of snail intermediate host of *Schistosoma* spp. shedding cercariae in the study area. This is an indication of the presence of schistosomiasis among the people living around the creek.

Recommendations

1. Deliberate health orientation of the people, provision of potation water to prevent the use of the creek as a source of water, and good sanitary habit will go a long way to prevent a possible increase in the prevalence of the infection.
2. Further study needs to be conducted to ascertain the occurrence and possible prevalence of human schsistosomiasis among the residents of study area.

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3. Again, record indicates that *Oncomelania* is the intermediate host of *S. japonicum*, (which is not prevalent in Nigeria) hence the cercariae shed by *Oncomelania* needs further scientific study to determine the species.

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