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Prevalence of Urinary Schistosomiasis and Associated Risk Factors Among Pregnant Women and Primary School Pupils in Ahoada Local Government Area, Rivers State, Nigeria

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Abstract
The prevalence of urinary schistosomiasis among pregnant women and primary school pupils in selected communities in Ahoada-East Local Government Area of Rivers State was investigated. The midstream urine sample was collected from 530 participants (146 pregnant women and 384 primary school pupils) into well-labelled 20ml screw-capped universal bottles for parasitological analysis. A standard zinc sulphate technique was adopted in the concentration of the parasites. A self-structured questionnaire was utilized to gather each participant's sociodemographic information. Results showed zero prevalence and zero intensity of urinary schistosomiasis with microscopy while examination of the urine samples with rapid diagnostic test kits for *micro*-haematuria and proteinuria indicated that out of 530 persons examined, 6 (1.1%) and 57(10.9%) positive cases were recorded for haematuria and proteinuria respectively. Out of the 6 positive cases of haematuria, 3(50%) and 350%) positive cases were found among pregnant women and primary school pupils respectively. Among the pregnant women, the age range of 21-25yrs, 31-35yrs and 36-40yrs had 1(1. 7%) positive case of haematuria each while the age range of 26-30yrs, 31-35yrs, 36-40yrs had 4(2.0%), 2(1.4%) and 1(0.7%) positive cases of proteinuria respectively. Among the primary school pupils, the only age group that was positive for haematuria was 10-15yrs with 3(0.78%) cases while the age groups of 5-9yrs and 10-15yrs had 10(2.6%) and 40(10.4%) cases of proteinuria respectively. Out of the 12 communities investigated, Ihuaha, Okporowo, Ochigba, Odiabidi, Ihuowo, Edeoha, Ula-upata, Ikata and Ahoada had 2.8%, 15.6%, 15.4%, 13.1%, 12.1%, 10.4%, 4.4%, 2.8% and 2.4% cases of proteinuria respectively. while Edeoha, Okporowo, Ihuaba, Ula-upata and Ikata recorded 1.3%, 5.7%, 2.0%, 4.4% and 2.8% of micro-haematuria respectively. The results suggest the presence of symptoms of urinary schistosomiasis, however, further investigation is required for confirmation since the eggs of the parasites were not detected in urine.

Keywords: Prevalence, Urinary Schistosomiasis, Haematuria, Proteinuria

Introduction

Urinary schistosomiasis is a parasitic blood disease caused by flukes of the genus *Schistosoma*, a common neglected tropical disease with recorded morbidity and mortality in many developing countries has remained a major health challenge with lots of socio-economic impact in places where sanitation and control efforts are not sufficient. (Sady et al., 2015). There are many species ranging from *Haematobium mansoni, H. japanicum, H. guineensis, H. intercatatum, H. mekongi, H. bovi*ete. All affects the intestine except haematobium which affects the urinary tract. Globally the prevalence of schistosomiasis is high with a current estimation of 779 million individuals at risk of illness, 218 million persons afflicted and approximately 90% living in Africa (Eltayeb et al., 2013; WHO, 2017). Approximately 207 million people are infected in 74 countries and 120 million of these people have acquired the disease (Oluwafemi et al., 2022). In sub-Saharan Africa, about 436 million people are at risk of infection and 112 million are infected. Nigeria has been reported to be the most endemic country globally with an estimated 29 million individuals afflicted and 101.3 million at risk of infection. Elele et al. (2012) reported a prevalence of 22.7% in some communities in Abua/Odua in Rivers State. Schistosomiasis affects two areas in the body which are the gastro-intestinal tract referred to as intestinal schistosomiasis and the genitourinary tract which may cause either urinary schistosomiasis or male and female genital schistosomiasis (Rukeme et al., 2018). Urinary schistosomiasis is common in tropical and subtropical areas of the world (Eyo et al., 2012., WHO, 2023). *Schistosoma haematobium*, a parasitic worm that resides in blood vessels in the bladder of an infected person and lays eggs in the bladder and ureter. The water snail, *Bulinus* species serves as the intermediate host. Urinary schistosomiasis is found to be prevalent in Africa and the eastern Mediterranean (Eyo et al., 2012) and has also been reported in Africa, the Middle East and Corsica in France (WHO, 2017). According to Adewale et al. (2020), urinary *schistosomiasis* is found in 54 tropical countries. An estimated 84% of the morbidity of urinary schistosomiasis occurs in Sub-Saharan Africa (Eyo et al., 2013).

Urinary schistosomiasis is found mainly in patients between the ages of 10-30 years as reported with children within the age range of 11-13 years having the highest incidence (Ezeh et al., 2019). WHO (2014) further proposed that urinary schistosomiasis primarily affects young people and school-age children in sub-Saharan Africa. About 40 million women of reproductive age are currently infected and 10 million women are infected during pregnancy (Mombo-Ngoma et al., 2017., Friedman et al., 2007; WHO 2003). Pregnant women are naturally immune-suppressed during the period of pregnancy and many of them live in schistosomiasis endemic areas and are likely to contract the disease with many eventually resulting in poor pregnancy outcomes as well as maternal and infant mortality (Friedman et al.,2017). It is estimated that in Africa, about 40 million women of reproductive age are currently infected and about 10 million women have schistosomiasis during pregnancy per year (Friedman et al., 2007; WHO, 2003). Although the prevalence of schistosomiasis among pregnant women has been recorded in a few rural communities in South Western Nigeria (Salawu&Odiabo, 2013) and semi-urban communities of Anambra State, Nigeria (Eyo et al., 2012), a lack of epidemiological data had been a major constraint hence the need for continuous search.

Primary school pupils generally referred to as school-aged children are vulnerable to infections which is because, at this age, their immunity is low and cannot withstand the invasion of any disease-causing parasite. The case is not different with schistosomiasis especially when resident in endemic areas. However, school-aged children are among the high-risk groups at risk of schistosomiasis due to their frequent water contact. Several studies carried out in Nigeria indicated that morbidity and mortality resulting from schistosomiasis are very high among school-aged children due to their activities involving extended contact with water, such as swimming and fishing, during peak hours of cercariae release by snail host, which is a risk factor in contact to infection (FMoH, 2015; WHO, 2016). This study was conducted with the view to gathering data on the prevalence of urinary schistosomiasis in the study area, however, Elele et al. (2012), have reported the prevalence in neighbouring communities of Abua/Odua Local Government area of Rivers State. The study was conducted between March 2023 and January 2024.

Materials and Methods

Study Area: Some communities in Ahoada-East Local Government Area, Rivers State, were selected for this study. Ahoada-East has an estimated average temperature of 27^0C and a total land area of 22341km with an estimated population of 166747 (NPC, 2006). The Local Government Area (Fig. 1) is situated between longitude $6^0$643” - $6^0$38”35 East and latitude $5^0$0703” -$5^0$4’13” North. The communities investigated were Okporowo (Health Centre: longitude 6.637336ºE and Latitude 4.957083ºN; State School: Longitude 6.635435E and latitude 4.964090ºN), Odiabidi (Longitude 6.636528ºE and Latitude 4.950112ºN), Ahoada (Health Centre: longitude 6.650897ºE and Latitude 5.078877ºN, St. Paul Primary School: Longitude 6.652298ºE and Latitude 5.079312ºN), Ochigba (Health Centre: Longitude 6.587281ºE and Latitude 4.997924ºN, State School: Longitude 6.588637ºE and Latitude 4.995963ºN), Ihuaba (Health Centre: Longitude 6.653524ºE and Latitude 5.073944ºN), Edeoha (Health Centre: Longitude 6.633651ºE and Latitude 5.023200ºN, UPE: longitude 6.626759ºE and Latitude 5.031209ºN) Ihuowo (Longitude 6.664395ºE and Latitude 5.007178ºN), Ogbele (Health Centre: longitude 6.670874ºE and Latitude 4.918731ºN, UPE: Longitude 6.673032ºE and Latitude 4.919280ºN), Ikata (Health Centre: Longtitude 6.599310ºE and Latitude 5.029245ºN, UPE: Longitude 6.598775ºE and Latitude 5.028723ºN), Obumeze (Health Centre:

Longitude 6.641568ºE and Latitude 4.936744ºN, State School: Longitude 6.641975ºE and Latitude 4.939419ºN), Ihuike (Health Centre: 6.6252493ºE and Latitude 5. 092698ºN, State School: Longitude 6.632825ºE and Latitude 5.088207ºN) and Ula-Upata (Longitude 6.625249ºE and Latitude 5.092698ºN).

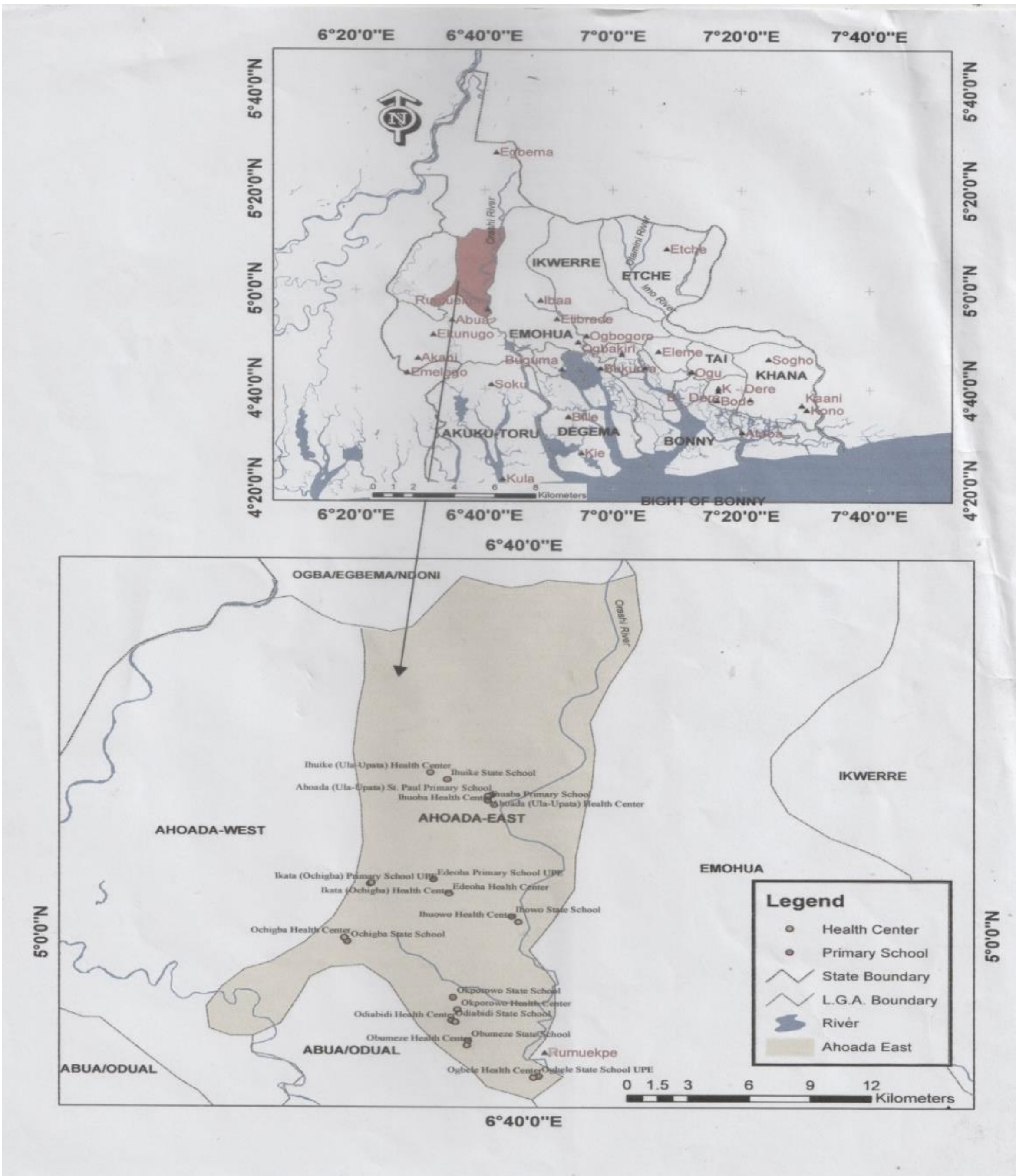

Fig. 1: Map of the study area
Source: Rivers State Urban and Regional Planning

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Clean well-labelled, plastic screw-capped 20ml universal containers were given to each participant for collection of midstream early morning urine samples. The participants were guided on how to obtain the urine sample. A total of 2mls of 10% formal saline was added to the content of the bottle to prevent eggs from hatching into miracidia before examination. The collected urine samples were taken to the research laboratory, Department of Biology, Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt for examination. Two 10 ml sub-samples were taken from each 20 ml urine sample. A 10 ml sample was set aside for microscopy and another for a biochemical test. The methods of Chesbrough (2018), and Gboeloh & Gbeghebo (2021) were adopted in the determination of the overall occurrence of this parasite by centrifugation and sedimentation technique. The method recommended by Adeyemi et al. (2014) was adopted to assess micro-haematuria and proteinuria, accu-answer combi 9 uristrip/uric 9v to examine the urine sample for blood and protein. Following the manufacturer's instruction, each reagent strip was dipped into each urine sample and matched with a colour chart on the test strip for detecting micro-haematuria and proteinuria.

Ethical clearance for this study was given by the Ministry of Health, Rivers State with the number MH/PRS/391/VOL.2/848, Rivers State Hospital Management Board (Health Research Ethics Committee) with the number RSHMB/RSHREC/2022/011 and Primary Health Care Board Port Harcourt. Consent of medical officers in various health centres, community leaders, head teachers of each primary school, parents or guardians of pupils and all participants in the study area were obtained.

A simple percentage was used to analyze the prevalence and intensity, heamaturia and proteinuria among pregnant women and primary school pupils about age and community.

Results

A total of 530 participants (146 pregnant women and 384 primary school pupils) were examined for the presence of *Schistosoma haematobium*, the causative agent of urinary schistosomiasis. Out of 530 persons examined, 0 (0%) were positive for the presence of *Schistosoma haematobium* (Table 1). However, examination of the urine samples with accu-answer uristrip/ uric combi 9v for *micro*-haematuria and proteinuria, symptoms associated with schistosomiasis indicated that out of 530 persons examined for haematuria and proteinuria symptoms of schistosomiasis, 6 (1.1%) and 57(10.9%) positive cases were recorded for haematuria and proteinuria respectively (Table 1). Out of the 6 positive cases of haematuria, 3(50%) and 350%) positive cases were found among pregnant women and primary school pupils respectively. Among the pregnant women, the age range of 21-25yrs, 31-35yrs and 3-40yrs had 1(1. 7%) positive case of haematuria each while the age range of 26-30yrs, 31-35yrs, 36-40yrs had 4(2.%), 2(1.4%) and 1(0.7%) positive cases of proteinuria respectively (Table 2). Among the primary school pupils, the only age group that was positive for haematuria was 10-15yrs with 3(0.78%) cases while the age groups of 5-9yrs and 10-15yrs had 10(2.6%) and 40(10.4%) cases of proteinuria respectively (Table 2). Out of the 12 communities investigated, Ihuaha, Okporowo, Ochigba, Odiabidi, Ihuowo, Edeoha, Ula-upata, Ikata and Ahoada had 2.8%, 15.6%, 15.4%, 13.1%, 12.1%, 10.4%, 4.4%, 2.8% and 2.4% cases of proteinuria respectively (Fig. 1), while Edeoha, Okporowo, Ihuaba, Ula-upata and Ikata recorded 1.3%, 5.7%, 2.0%, 4.4% and 2.8% of micro-haematuria respectively.

Table 1: Overall Prevalence of Urinary Schistosomiasis among pregnant women &Primary School pupils

Participants	**Number Examined**	**Number Infected**	**Prevalence (%)**
Pregnant Women	146	0	0
Primary School Pupils	384	0	0
Total	**530**	**0**	**0**

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Table 2: Prevalence of Micro-Haematuria and Proteinuria about age.

Variables	Haematuria			Proteinuria		
	No Examine	**No Positive**	**%**	**No Examine**	**No Positive**	**%**
Age (Pregnant Women)						
16-20	3	0	0	3	0	0
21-25	26	1	3.85	26	0	0
26-30	36	0	0	36	4	11.11
31-35	38	1	2.63	38	2	5.26
36-40	34	1	2.94	34	1	2.94
41-45	9	0	0	9	0	0
Total	**146**	**3**	**2.05**	**146**	**7**	**4.79**
Age (Primary school pupils)						
5-9	83	0	0	83	10	12.05
10-15	300	3	1	300	40	13.33
16-20	1	0	0	1	0	0
Total	**384**	**3**	**0.78**	**384**	**50**	**0.78**

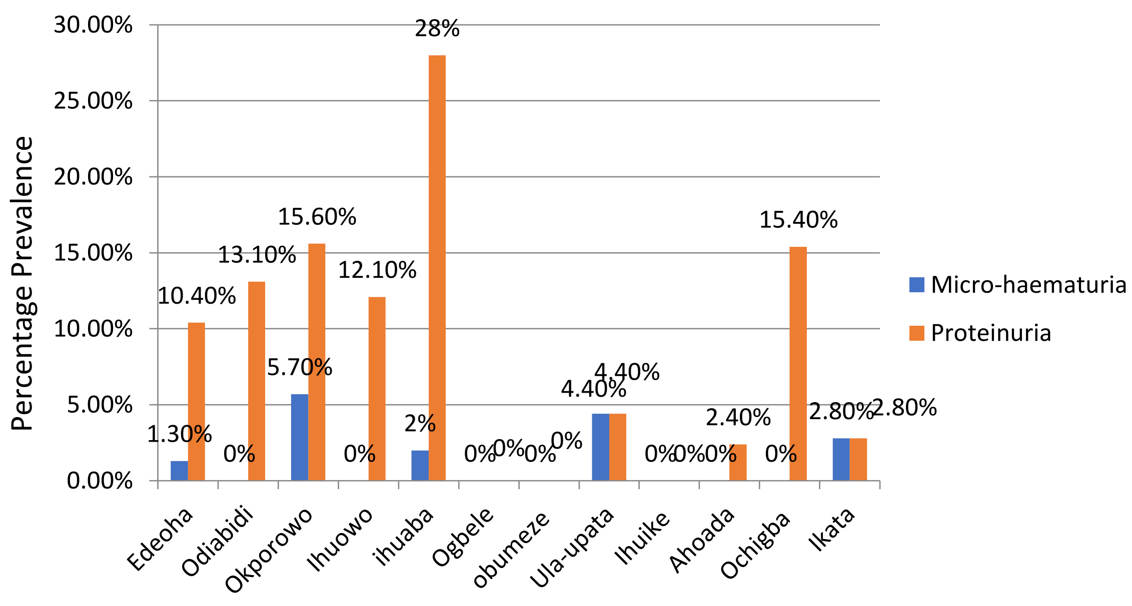

Fig. 1: Prevalence of Micro-haematuria and Proteinuria in relation to communities

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Risk factors associated with urinary schistosomiasis in the study area

The results of the self-structured questionnaire indicated that 67(12.64%) responded positively to bathing and drinking river/stream water, 182 (34.34%) used well water, 4 (0.75%) used pond water, 225 (42.45%) used borehole water and 52 (9.81%) had no response. Out of the 530 respondents, 221 (41.70%) used the water for swimming, 57 (10.75%) used it for domestic activities 139 (26.23%) used the water as an access road for agricultural activities and 113 (21.32%) had no response (Table 3).

Table 3: Risk factors associated with transmission of urinary schistosomiasis in the study area

Risk factor	No. of respondents (%)
Source of drinking/bathing water	
Rivers/Stream	67 (12.64)
Well	182 (34.34)
Pond	4 (0.75)
Hand pump/Borehole	225 (42.45)
No. Response	52 (9.81)
Total	**530**
Water/stream contact activities	
Swimming	221 (41.70)
Carrying out domestic chores	57 (10.75)
Crossing of water (Stream) for agricultural activities	139 (26.23)
No water contact	113 (21.32)
Total	**530**

Determination of knowledge and perception of pregnant women and primary school pupils towards urinary schistosomiasis in the study area based on age and community

Questionnaires were distributed to all participants in the study area to determine their knowledge and perception of urinary schistosomiasis. Responses from the questionnaire indicated that only about 6 (1.13%), 5 (3.42%) pregnant women and 1 (0.26%) primary school pupil respectively of the participants knew urinary schistosomiasis with the highest in age-group 31-35,2(5.3%) while 524 (98.87%) did not know urinary schistosomiasis. In community-based awareness, the Edeoha community had the highest 3(3.9%) followed by Ahoada 2(4.76%) and Odiabidi 1 (1.64%) while the rest communities did not know urinary schistosomiasis. This implies that a large proportion of the participants did not know about urinary schistosomiasis, symptoms associated with it, transmission mode or prevention before the study. Among the participants that claim to know, none was able to mention the intermediate host of urinary schistosomiasis, a risk factor associated with transmission and any local name attached to it(Fig. 2). The results also showed a significant difference ($p<0.05$) in the number of respondents that lack knowledge of schistosomiasis in the various communities investigated (Fig.2). This was significant ($p<0.05$).

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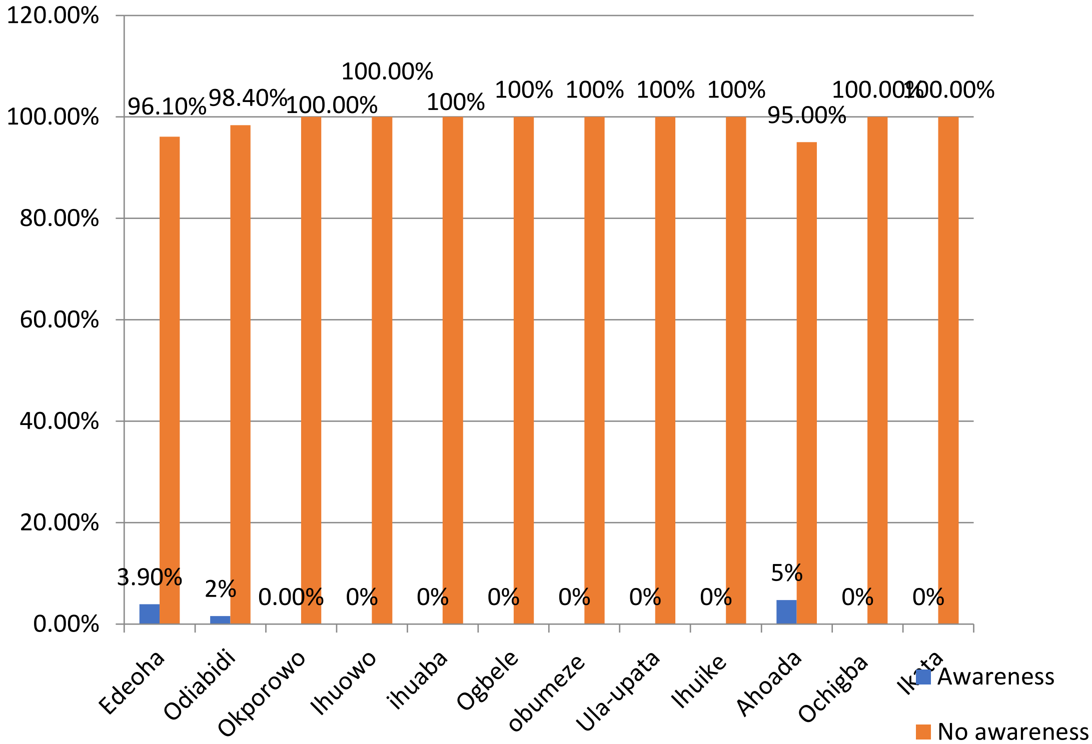

Fig. 2: Community-based awareness of urinary schistosomiasis

Discussion

Urinary schistosomiasis has received little attention compared to other neglected tropical diseases and has remained one of the major public health concerns. The burden of those stricken by the condition, who are still alone and experiencing its negative effects, has not decreased considerably despite attempts to control it throughout time (WHO, 2021). The result of the study showed an overall prevalence rate of 0%, but this result is contrasted with 5.1% in a settlement near Kanji dam of Niger state and 4.2% in a peri-urban community in Inepodun, Osun state, Nigeria (Oyelami et al., 2022; Adewale et al., 2020). The difference among these studies could be attributed to the types of water bodies and contact practices which require future investigation. The zero prevalence in this study may have been attributed to the extinction of the snail vectors in most of the study area due to unfavourable environmental conditions occasioned by the emergence of illegal refining of fuel and limited access to natural water bodies. The result obtained showed an overall prevalence of 1.13% for haematuria and 10.75% for proteinuria among pregnant women and primary school children in Ahoda LGA. This contradicts the 78% of Adeyemi et al. (2014) and corroborates with a range of 0.95% prevalence reported by Oluwafemi et al. (2022). However, the low prevalence of haematuria could be a result of cases of *Schistosoma haematobium* but due to other factors such as damage to the glomeruli of the kidney allowing red blood cells to leak into urine which results in microhaematuria.

However, there was no significant difference in the prevalence of Pregnant women (2.05%) and primary school pupils (0.78%) This may be an indication that both groups and ages are exposed to the infection through water contact. This is because haematuria is a characteristic symptom of urinary schistosomiasis in endemic communities. This study reveals no significant difference between the prevalence of haematuria and proteinuria about age and community among pregnant women and primary school pupils. The mean intensity of infection reported a zero intensity indicating that no egg of Schistosoma egg was observed. This also corroborates the report of Soniran et al. (2015) in two communities of Ebonyi State in a study conducted among primary school pupils and disagrees with with the study of Adewale et al.(2020) in three communities around Kanji dam in Niger State conducted among primary school pupils who recorded intensity of 5.97 eggs/10ml, and 1.14 eggs/10ml reported by Oyelami et al.

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(2022) and peak mean intensity of 7.6eggs/10ml and lowest mean intensity of 10 eggs/10ml as recorded by Eyo et al. (2012) among pregnant women.

The use of borehole water, ponds, well water, rivers/streams for domestic and agricultural activities and defecating in open spaces and in water bodies were identified in the study as significant risk factors associated with the transmission of the infection among the respondents. This finding corroborates with the study of Mbah and Useh, (2008) who reported that in Nigeria, schistosomiasis is endemic, particularly among the poor in most rural communities. It is a disease of the poor that thrives in environments that facilitate transmission. In our study, zero prevalence of urinary schistosomiasis was found among respondents who use boreholes, ponds, well water, open defecation and the use of stream water for domestic activities. Hence, it can be deduced that the predominant practice of open defecation, which is a poor sanitary system among the respondents has little or no influence on the prevalence of urinary schistosomiasis in the community. This is in contrast with the report of Pinot de Moria et al. (2007) who indicated that poor toilet facility contributes to the spread of the infection among primary school children.

The knowledge and perception of urinary schistosomiasis among participants in the study revealed poor knowledge and perception as only 6 (1.13%) knew while 524 (98.87%) did not know. Among the participants that know, none could identify the mode of transmission of urinary schistosomiasis, intermediate host, or risk factor associated with transmission; which implies that the disease may not have existed in the study area. This study agrees with the findings of other researchers (Oluwafemi et al., 2022; Anorue et al., 2021; Soniran et al., 2015).

Conclusion

The findings of this study found a zero prevalence of urinary schistosomiasis among pregnant women and primary school children in Ahoada Local Government Area. This may have been due to the extinction of the snail vector in most of the areas as a result of unfavourable environmental conditions occasioned by artisanal refineries, the no-residence of snail vectors occurring seasonally (rainy season) in some of the areas, the availability of handpump or borehole providing good water source in some of the areas, the large number of participants with no water contact with a limited number of them that pass urine and faeces in the river as well as drinking water from rivers or stream. Also, the occurrence of haematuria may have been as a result of damage to the glomeruli of the kidney allowing red blood cells and protein to leak into urine which may have risen due to other infections among primary school pupils, or pregnancy-induced or spotting among pregnant women. However, there is still a risk of transmission due to a lack of awareness of the disease in the study area and risk factors such as passing of urine and faeces in water bodies, swimming and carrying out domestic chores in water bodies influencing disease transmission among the study population. Hence campaign awareness and an integrated approach are needed in this area.

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