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Original Research Article

Occurrence of Soil-Transmitted Helminths and *Helicobacter pylori* among Healthy Asymptomatic Occupants of a Public Social Welfare Home in Port Harcourt Metropolis, Rivers State, Nigeria

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Abstract: The occurrence of Soil Transmitted Helminths (STHs) and *Helicobacter pylori* among children in Port Harcourt Children's home was investigated. Faecal and blood samples were collected from the participants. The faecal samples were examined for the presence of STHs using the direct smear and modified acid fast staining techniques while the blood samples were serologically investigated for the presence of *H. pylori* using the *H. pylori* IgG antibody kit. Out of the 99 children examined, 14(14.1%) and 54(54.5%) were positive for STHs and *H. pylori* respectively. The STHs identified included Hookworm (35.7%), *Trichiuri trichiura* (35.7%) and *Ascaris lumbricoides* (21.4%). Double infections of *A. lumbricoides* + *H. pylori* (21.3%), Hookworm + *H. pylori* (35.7%), *T. trichiura* + *H. pylori (35.7%)* and mixed infection of *A. lumbricoides* + Hookworm + *H. pylori (7.1%)* was recorded. The occurrence of *H. pylori* in relation to sex, age and level of education among the children showed no statistical significance ($p < 0.05$). Health education of the children and sustenance the policy and health strategies that ensure low prevalence of the infections should be encouraged. Furthermore, there should deliberate action plan to improve on the availability and accessibility to healthcare in the study area.

Keywords: *Helicobacter pylori*, Soil-Transmitted Helminths, Children home, Port Harcourt Homes.

INTRODUCTION

Infections caused by Soil-transmitted helminths constitute major health concern globally especially in developing countries where is poor sanitation and high level of poverty. Approximately, 3.5 billion persons are infected and an estimated 450 million people are ill due to soil-transmitted helminths worldwide (Hailegebriel, 2017). Records indicate that soil transmitted helminths (STHs) is more serious in Sub-Saharan Africa, Asia and Latin America where there is inadequate environmental sanitation, water supply, fast population growth and poor standard of socio-economic values (Mohammed *et al*., 2015). Soil transmitted helminths is responsible for an estimated 12% of the total global disease burden and this is particularly observable among children within the age ranges of 5 and 14 years in developing countries of the world (Awasthi *et al*., 2003). About 270 million preschool and 600 million school children are living in area where high transmission of parasitic worm (WHO, 2016) which is an indication that children are the most vulnerable group for parasitic infection. Most parasitic protozoa and helminths are the known parasites of the gastrointestinal cavity; soil-transmitted helminths such as *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm are the most prevalent and affect about one-sixth of the world population (Harhay *et al*., 2010). *Ascaris lumbricoides* is responsible for about 1.2 billion infections globally while T. trichiura and hookworm infection accounts for an estimated 795 million and 740 million respectively (Alum *et al*., 2010). However, among the protozoan parasite, *Entamoeba histolytica* and Giardia lamblia are the most dominant cause of intestinal morbidity in children (Atting *et al*., 2018). The protozoan parasites that are most commonly associated with gastrointestinal diseases are *Giardia intestinalis*, *Entamoeba histolytica*, *Cyclospora cayetanenensis*, and *Cryptosporidium* species (Davis *et al*., 2002).

Studies revealed that soil-transmitted helminths occur mostly in high humid regions of the world where other climatic conditions favour the survival and transmission of these parasites. Other epidemiological factors that encourage striving of the parasites include lack of potable water, inadequate healthcare, and poor educational awareness (Hadiza *et al*., 2019).

Helicobacter pylori (H. pylori) is a ubiquitous, helical shaped, motile, Gram-negative microaerophilic bacterium, which colonizes the gastric mucosa (Rafeey *et al*., 2007). Generally, its colonization in humans is occurs during the first 5 years of childhood (Rajindrajith *et al*., 2009) and it is found mostly among children in which Its prevalence ranges from 30 to 80% (Suerbaum & Michetti, 2002). Although the prevalence differs from one region to the other in the same country, the parasite is more common in regions and countries that lack clean drinking water and poor sewage disposal system (Suerbaum & Michetti, 2002).

Helicobacter pylori falls among the human bacterial infection considered to be chronic, infecting 25-50% of the people of developed countries and 70-90% of the population of developing countries (Gillespie & Hawkey, 2006). H. pylori has been recognized as a Class I carcinogen by the International Agency for Research on Cancer (Konturek, 2003) and as one of the strongest known risk factors for gastric malignancies (Lesbros-Pantoflickova *et al*., 2007; Frenck & Clemens, 2003; Sethi *et al*., 2013).

Most of the infected individuals remain asymptomatic for a long period. As a result, long-lasting colonization of H. pylori can injure the gastric mucosa causing various diseases of the upper gastrointestinal tract such as chronic gastritis, peptic ulcer, and gastric malignancies, particularly gastric cancer and gastric mucosa-associated lymphoid tissue (MALT) lymphoma (Guerrant *et al*., 2011).

Although the mode of transmission of H. pylori is still unclear, transmission may occur through direct contact with fluid of infected persons. This occurs mostly through faecal–oral route among immunocompromised children and children experiencing vomiting, fever, diarrhea and dehydration (Kim, 2016).

Diagnosis of H. pylori infection is generally divided into invasive and non-invasive approaches. A combination of at least two tests is commonly used as a gold standard (Sethi *et al*., 2013). However, the organism could be easily identified in all microbiology laboratories using simple techniques (Guerrant *et al*., 2011). Numerous serological diagnostic tests used for the detection of H. pylori include bacterial agglutination, complement fixation, indirect immunofluorescence test, enzyme immunoassay, and enzyme-linked immunosorbent assay (Kim, 2016).

Several studies on H. pylori have been conducted in various parts Nigeria with variable high prevalent rate. (Ishaleku & Ihiabe, 2010; Tijjani & Umar, 2008; Olokoba *et al*., 2013) recorded 54%, 81% and 93.6% prevalent rate of the infection in Nassarawa, Kano and Maiduguri respectively.

In spite of these studies, the overall true prevalence rate of the disease among the Nigerian populace is not certain (Ndububa *et al*., 2001). However, over 30 years ago, Nigeria was listed as an area of high H. pylori prevalence with perforation being the most frequent indication for surgery (Ndububa *et al*., 2001).

Similar studies have also been done in hospitals in Port Harcourt (Ayodele *et al*., 2018; Andrew *et al*., 2013) but no similar work has been reportedly conducted among residents of social welfare homes in Port Harcourt. This study is therefore aimed at the evaluation of the coinfection of STHs and H. pylori among occupants of social welfare homes in Port Harcourt.

Experimental Section/Materials and Methods: Study Area

The study was conducted at Port Harcourt Children's Home, located on Nembe street, Borokiri, lies at latitude 4.749^o N and longitude 7.035^o (Fig-1). Port Harcourt. Rivers State, Nigeria (Fig 1). The home is owned and managed by the Rivers State Government. Borokiri community is bounded by Ahoada street, Okrika Island, Orubiri oilfield to the north, east and west respectively. It is majorly a residential area and residents are engaged in commercial and institutional services.

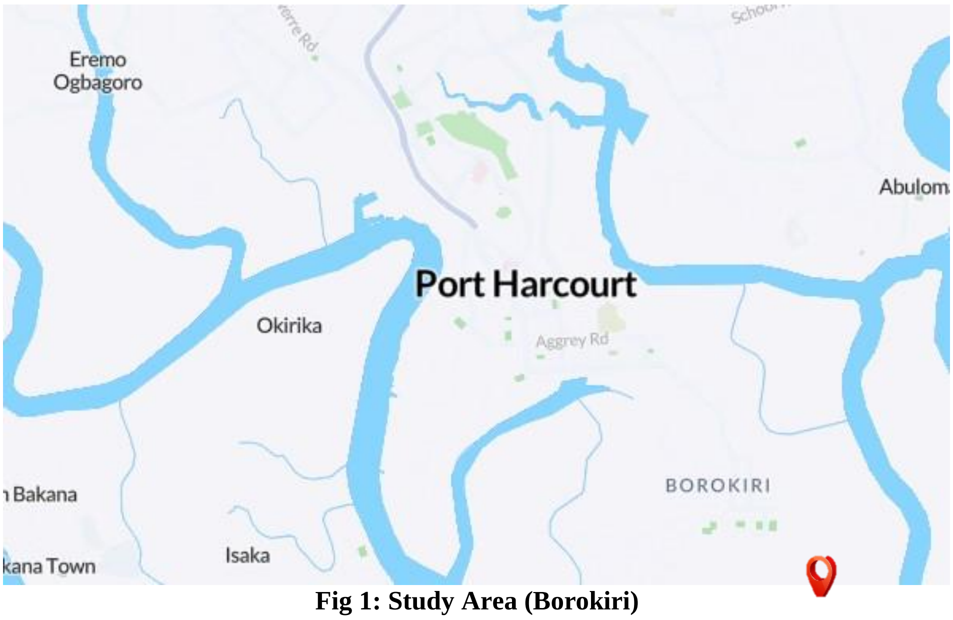

Fig 1: Study Area (Borokiri)
Source: Google map

Study Design: The study was a cross section survey involving collection of samples and use of questionnaire to obtain data on certain socio-demographic characteristics of the participants.

Sample size and sample collection: The sample size was determined using the method of Cochran (1977). The formula used was:
$n = Z^{2\,*}p(1-p)/ M^2$,

Where:
n = sample size for infinite population
Z = Z score (1.96),
p = Population proportion (assumed to be 50 % = 0.5)
M = Margin of error (0.05) (Cochran, 1977)

Hence, samples size of 99 participants were enrolled in the study. Faecal and blood samples were collected from 99 occupants (52 females and 47 males). Sterile specimen bottles containing 10% formalin, for the collection of stool samples were distributed to participants with the help of the officers of the home. The participants were instructed on the methods for collection of the samples. Blood samples were collected from each participant into well labelled EDTA bottles. All samples were transported to Ignatius Ajuru University of Education for laboratory examination.

Laboratory Examination

The stool samples were screened for the presence of helminthes parasites using direct smear examination, modified acid fast staining techniques and formol-ether concentration technique by method of Kuo *et al*., (2008).

The blood samples were examined serologically for H. pylori immunoglobulin G (IgG) antibodies using immune chromatographic rapid test kits (Global H. pylori test kit, China), which is nationally approved and used for serological diagnosis of H. pylori infection. The manufacturers' instruction was strictly followed for diagnosis of H. pylori infection.

Parasitological examination of stool samples
Direct Smear Examination for Stool Samples

For the direct smear, 1-2g of the stool sample was emulsified in few drops of normal saline placed on a slide and observed under the microscope using x40 objective lens. A drop of iodine was added to reveal characteristics features of the parasites (Wakid, 2006).

Modified acid fast staining techniques

Smears are prepared after concentration, air dried and then fixed in methanol, stained with Kinyoun carbol-fuchsin for 4-5 minutes, distained with 1% aqueous sulfuric acid for 2-3 minutes, rinsed with distilled water and then counterstained with Loeffler's alkaline methyline blue for 1 minute. Smears are rinsed with distilled water drained and dried (Garcia, 2007).

Helicobacter pylori IgG antibody test examination

The blood samples were examined serologically for H. pylori IgG antibodies using immune-chromatographic rapid test kits (Global). The test device and patients' serum were allowed to attain room temperature before commencement of test. According to the manufacturers' instructions, each blood sample was centrifuged at 3500 rpm for 5 minutes and a sterile Pasteur pipette was used to separate the clear serum into a clean test tube. The test device was removed from the foil pouch and placed on a clean level surface. A sterile Pasture pipette was used to transfer 100ul of patient's serum to the well of the test device marked "S", avoiding air bubbles. A timer was set for 10minutes within which the red line(s) appear. Two distinct red lines (one on the control C and the other on the test T) indicate positive result. One red line only on the control C indicates negative result. One red line only on the test T or no line at all on both control C and test T indicate invalid result and the test repeated with new test kit/device.

Ethical Considerations

Institutional ethical clearance and the research permit and authorization letter for this study was obtained from the Rivers State Hospitals Management Board and Rivers State Ministry of Social Welfare and Rehabilitation. Prior to sample collection, participants were clearly informed about the objective and procedure of the study and only those that agreed to participate in the program was sampled.

Data Analysis

The data collected were analyzed using SPSS, version 23. Chi-Square was used to determine significant relationship between variables at a significant value of $p < 0.05$.

RESULTS AND DISCUSSION

Prevalence of soil-transmitted helminths among occupants

Out of 99 occupants examined (52 females and 47 males), 14(14.1%) were positive for the presence of soil transmitted helminthes. The parasites isolated included *Trichuris trichiura* 5(35.7%), hookworm 5(35.7%) and *Ascaris lumbricoides* 3(21.4%). A mixed infection of A. lumbricoides and hookworm 1(7.1%) was recorded (Fig 2).

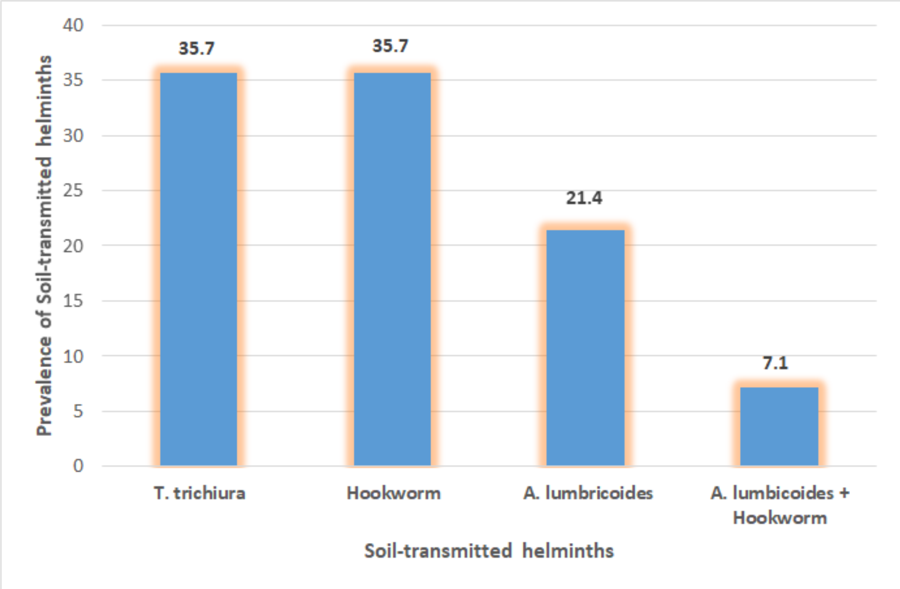

Fig 2: Prevalence of Soil-transmitted helminths

Prevalence of H. pylori

Fig-3 shows the overall prevalence of H. pylori. Out of the 99 occupants investigated for the presence of the bacteria, 54 persons representing 54.5% of the sampled population were infected.

Sex-related distribution of H. pylori among occupants

The distribution of Helicobacter pylori in relation to sex were recorded. There was no statistical difference (P>0.05) in the distribution of the organism in both sexes. Both male and female had a prevalence of 27(50.0%) each (Table 1).

Table 1: Sex-Related Occurence of Helicobacter pylori

	Helicobacter pylori Reaction				
	No. Examined	**No. Positive (%)**	**No. Negative (%)**	**Chi-Square (X^2)**	**p-value**
Sex					
Female	52	27(50.0)	25(55.6)	0.304	0.582
Male	47	27(50.0)	20(44.4)		
Total	**99**	**54(54.5)**	**45(45.5)**		

P > 0.05

Distribution of H. pylori among occupants in relation to age

The result of the study indicates that children within the age range of 6-10years had the highest prevalence 31(57.4%) while occupants within the age range of 11-15years had 13(24.1%). The least prevalence of 1(1.9%) was recorded among the age group of 26 - 30 (Table 2). The distribution of H. pylori across the age group investigated was not statistically significance (P>0.05).

Table 2: Age-Related Occurence of Helicobacter pylori

		Helicobacter pylori Reaction			
	No. Examined	**No. Positive (%)**	**No. Negative (%)**	**Chi-Square (X^2)**	**p-value**
Age					
0 - 5yrs	9	4(7.4)	5(11.1)	3.975	0.553
1 - 5yrs	3	3(5.5)	0(0.0)		
6 - 10yrs	58	31(57.4)	27(60.0)		
11 - 15yrs	25	13(24.1)	12(26.7)		
26 - 30yrs	1	1(1.9)	0(0.0)		
31 - 35yrs	3	2(3.7)	1(2.2)		
Total	**99**	**54(54.5)**	**45(45.5)**		

P > 0.05

Distribution of Helicobacter pylori among occupants in relation to education

Table 3 shows that children in primary school had the highest prevalence of Helicobacter pylori 36(66.6%), followed by pre-school age children 10(18.5%) and 1(1.9%) was recorded for the secondary school group. This distribution was not also statistically significant (P > 0.05).

Table 3: Occurrence of Helicobacter pylori among Occupants in relation to education (n=99).

		Helicobacter pylori Reaction			
	No. examined	**No. Positive (%)**	**No. Negative (%)**	**Chi-Square (X^2)**	**p-value**
Education level					
Non-educated	4	3(5.6)	1(2.2)	1.693	0.792
Educated	9	4(7.4)	5(11.1)		
Pre-School age	19	10(18.5)	9(20.0)		
Primary	64	36(66.6)	28(62.2)		
Secondary	3	1(1.9)	2(4.4)		
Total	**99**	**54(54.5)**	**45(45.5)**		

P > 0.05

Co-infection of H. pylori and Soil-Transmitted Helminths

Table 4 shows the co-infection of soil transmitted helminths and H. pylori**.** The results indicated that out of 99 occupants investigated, only 14(14.1%) had a co-infection of soil transmitted helminths and H. pylori. The most common co-infection identified was Hookworms+ H. pylori 5(35.7%) and T. trichura + H. pylori 5(35.7%), followed by A. lumbricoides + H. pylori 3(21.1%) and a mixed infection of A. lumbricoides + Hookworm + H. pylori 1(7.1).

Table 4: Co-infection of Soil-Transmitted Helminths and H. pylori (n=99)

Soil-Transmitted Helminths	**No. Positive (%)**	**Chi-Square (X^2)**	**p-value**
A. lumbricoides + H. pylori	3(21.2)	3.5	0.484
Hookworm + H. pylori	5(35.7)		
T. trichiura + H. pylori	5(35.7)		
A.lumbricoides + Hookworm + H. pylori	1(7.1)		
Total	**14(14.1)**		

P > 0.05

The study shows a relatively low prevalence of soil transmitted helminths among the studied population. The 14.1% prevalence rate recorded in this study is lower than the 75.7% reported by Gboeloh & Ndamzi, (2019) among pupils of community primary school in Nkpor and Mgbodohia, Rivers State., it is also lower than the 42.6% recorded among Nigeria Children in Jos by Samuel *et al*., (2019), 55.2% reported by Isaac *et al*., (2019) in primary school playground in Edo State, Nigeria and the 30.3% observed by Odinaka *et al*., (2015) among children in rural communities in Imo Sate, Nigeria. The lower prevalence of 14.1% recorded in our study could be attributed to the periodic mass deworming exercise conducted by the Rivers State Ministry of Health.

T. trichiura and hookworm were the highest prevalence of 35.7% each. This is higher than the 13.6% for T. trichiura and 23.5% for hookworm reported by Gboeloh & Ndamzi, (2019) in Port Harcourt. The recorded results for T. trichiura and Hookworm in this study was also higher than the 10.3% and 5.1% for T. trichiura and Hookworm respectively as reported in Jos (Samuel *et al*., 2019). The prevalent rate of hookworm was however lower than the 94.2% reported in Imo State (Odinaka *et al*., 2015).

Generally, the difference in prevalence rate of soil transmitted helminths recorded in this study may be due to the level awareness, timing of the study, the periodic deworming exercise conducted by relevant bodies, level of personal hygiene and sanitation, availability and accessibility of healthcare facilities and the specific study area the studies were conducted (Samuel *et al*., 2019; Ugbomoiko *et al*., 2006; Onyemaobi & Onimawo, 2011).

H. pylori is the most prevalent human bacteria and the disease caused by the bacterium is a serious global health concern, especially in developing countries. The infection is mainly acquired in early childhood, and can lead to gastritis in children and peptic ulcer in adults (Isaac *et al*., 2019; Odinaka *et al*., 2015; Ugbomoiko *et al*., 2006). In this study, the prevalence of the H. pylori was 54.5%. The 54.4% observed in this study is in agreement with the 54% recorded by Shaleku and Ihiabe, (2010) among students of Nassarawa State University but lower than the 93.6% recorded by Olokoba *et al*., (2013) in Maiduguri and the 81% reported by Tijjani and Umar (2008) in Kano. The result (54.5%) is however higher than the 19.6% reported by Ayodele *et al*., (2018) in Port Harcourt. The variation in the results recorded by the researchers may be partly attributed to differences in personal hygiene among the study population and the availability and accessibility of healthcare services in the respective study area.

The sex-related prevalence of H. pylori was not statistically significant. Similarly, the sex-related prevalence was not also statistically significant. Although the study population within the age range of 6-10years and 11-15years had the highest numerical value 31(57.4%) and 13(24.1%) respectively, this was not statistically significant when compared across all age range. This is at variant with the report of 6.88% at age 51-60years, 85-7% at age 31-40years, 66.7% at 41-50years and 28.6% at age 51years (Ishaleku & Ihiabe, 2010).

Soil-transmitted helminths and H. pylori mostly occur in low income developing countries and may be linked mechanically or pathologically. H. pylori shares the associated gastrointestinal symptoms of soil-transmitted helminths and the same mode of transmission. This may suggest the association of H. pylori infection with gastrointestinal parasites (Ibrahim, A *et al*., (2019).

In this study, the overall prevalence of soil-transmitted helminth coinfection H. pylori among occupants of public homes was 14.1% for soil-transmitted helminths and 54.5% for H. pylori.

The result recorded in this study indicated that there was no statistically significant relation between H. pylori and soil transmitted helminths in the study population. This observation does not conform with the reports of Rahman *et al*., (2013) in Turkey and Ibrahim *et al*., (2019) in Egypt.

CONCLUSION

The study recorded a low prevalence of soil-transmitted helminths and H. pylori among the study population. However, there is need to sustain the policy and health strategies that ensured this status. Furthermore, there should deliberate action plan to improve on the availability and accessibility to healthcare in the study area.

Conflict of interest: Authors declared no conflicts of interest.

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