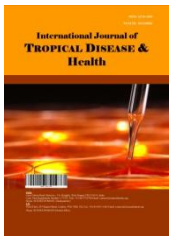

International Journal of TROPICAL DISEASE & Health

43(1): 12-17, 2022; Article no.IJTDH.81640
ISSN: 2278–1005, NLM ID: 101632866

Assessment of Risk Factors and Outcome of Co-Infection of Soil Transmitted Helminths and *H. pylori* among School Age Children Living in Riverine Slum Settlements in Port Harcourt, Nigeria

E. O. Onosakponome [a*], A. A. Adedokun [b] and Michael N. Wogu [c]

[a] Department of Medical Laboratory Science, Pamo University of Medical Sciences, Port Harcourt, Nigeria.
[b] Department of Medical Laboratory Science, Fountain University, Osogbo, Nigeria.
[c] Department of Animal and Environmental Biology, University of Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Author EOO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AAA and MNW managed the analyses of the study. Author EOO managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2022/v43i130567

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/81640

Original Research Article

Received 30 October 2021
Accepted 03 January 2022
Published 05 January 2022

ABSTRACT

Soil transmitted helminths and *Helicobacter pylori* are well-known for their high prevalence worldwide. In developing countries, Soil-transmitted helminths (STHs) and *H. pylori* infectionis highly prevalent especially in human populations with low socioeconomic status and personal hygiene which promote the spread of these infections.

Aim: The objective of this study was to assess risk factors and co-infection of soil transmitted helminths and *H. pylori* among school age children living in Riverine slum settlements in Port Harcourt, Nigeria.

Methodology: A community-based study was conducted among 300 school age children from December 2018 to May 2019. Stool and venous blood samples were collected for analysis of STHs and *H. pylori* infection using standard methods, respectively after due ethical approval was obtained. Data was analyzed using SPSS version 16. A $p \leq 0.05$ was considered as statistically significant.

**Corresponding author: Email: eonosakponome@pums.edu.ng, onosaeve@gmail.com;*

Results: STHs and *H. pylori* IgG were detected in 36(12.0%) and 35(11.7%) of participants, respectively. The Prevalence was insignificant (P=05). Prevalence of *H. pylori* and STHs was not statistically associated with settlement location, age group or sex of the study. Poor hand washing practice and irregular deworming exercise are the major risk factors affecting the transmission of infection in the study populations.
Conclusions: Though prevalence is insignificant, we advice that better hygiene policies and adequate measures to prevent feacal- oral infection in school children for healthier status of school children and teenagers.

Keywords: Soil transmitted helminthes; prevalence; H. pylori; school aged children; risk factors.

1. INTRODUCTION

Soil transmitted helminths are one of the most frequent infections in the world, affecting an estimated 3.5 billion people and infecting 450 million people [1]. These infections are a major public health concern because they induce anaemia due to iron deficiency, growth retardation in children, and other physical and mental health issues [2,3,4]. *Ascaris lumbricoides*, Trichuris trichiura, Enterobius vermicularis, and Hookworms are pathogenic intestinal protozoans that infect the small and/or large intestine and harm people in tropical countries [5]. In children, these intestinal protozoa can induce acute diarrheal illnesses [6-9]. Children are more vulnerable to the small intestinal protozoa *Giardia lamblia* and Cryptosporidium spp., but adults of all ages are more susceptible to the large intestine disease *Entamoeba histolytica*. Cryptosporidium and Isospora belli, in particular, cause considerable morbidity in immunocompromised individuals [10].

The most prevalent chronic human bacterial infection is Helicobacter pylori, which affects 70-90 percent of the population in underdeveloped nations and 25-50 percent of the population in industrialized countries [11]. *H. pylori* colonizes the stomach's mucus layer and induces chronic active gastritis inflammation [12]. It is a major cause of peptic ulcers and a risk factor for gastric malignancies [13]. *H. pylori* has similar mode of transmission with STH and strong co-relation to socio economic levels [14].

There are few studies, which investigated co-infection between *H. pylori* and certain protozoa (*G. intestinalis, E. histolytica,* and *Blastocystis* spp.) [15-20]. The primary objective of the present study was to evaluate *H. pylori* prevalence and its co-existence with intestinal parasites among school aged children living in Riverine slum settlements of Port Harcourt. We also estimated the risk factors, which are thought to influence the prevalence of this coinfection.

2. METHODOLOGY

Study area: The study was carried out in Eleme Local Government Area (latitude 5^{o}04'60.00"N and longitude 6^{o}38'59.99"E) Rivers State.

Study Design: The study was a Cross-sectional randomized study.

Sample Size: Study participants (300) aged between 1 - 18years were enrolled from April - december 2019. Participants were categorized based on sex and age.

Sample Collection: Data collection Questionnaires were used to obtain information on socio-demographic factors and personal hygiene and lifestyle from participants that consented to the study.

2.1 Laboratory Diagnosis

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards.

About 5 ml of venous blood was collected from each participant and serum was separated for serological testing. Thereafter, each participant was given a pre-labeled clean and dry plastic container to collect fresh stool specimen so as to check for intestinal parasites. The blood samples were examined serologically for *H. pylori* immunoglobulin G (IgG) antibodies using immune-chromatographic rapid test kits (*H. pylori* test kit, LabAcon, 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

Emulsifying around 2 g of faeces in 10-15 ml of 10% formol saline was used in the Ritchie sedimentation procedure. After 30 minutes, the suspension was strained through two layers of gauze into a 15 ml conical centrifuge tube and centrifuged for 5 minutes at 2000 rpm. The washing stage was repeated as needed until the supernatant became clear. The sediment was resuspended with 10 ml of 10% formal saline and allowed to stand for 5-10 minutes. A total of 3 ml of diethyl ether was added, and then the tube was shaken vigorously for 30 seconds and centrifuged at 2000 rpm for 5 minutes. After centrifugation, the applicable diagnostic stages formed sediment in the bottom of the tube. The fecal debris was separated in a layer between the diethyl ether and the 10% formol-saline layers. The top three layers were discarded while the sediment remained at the bottom when a faecal debris layer was dislodged with a wooden stick and the tube was quickly inverted to discard the top three layers. To the sediment, one to two drops of iodine were added and thoroughly stirred. The silt was then transferred to a microscope slide, coated with a cover glass, and microscopically scanned using low and high objective lenses [3].

3. RESULTS

An overall prevalence of 35(11.6) and 36(12.0) respectively was recorded for H.Pylori and STH (Table 1). In this study, only three species of STH (Ascaris lumbricoides, Hookworm and Trichuris trichiura) were observed; Trichuris trichiura Hookworm had the highest and least prevalence of 18(50.0%) and 07(19.4%) respectively (P = .05) According to age, children in age groups 7 – 12years had the highest prevalence for STH while age group 1- 6 years had the highest prevalence fo H.pylori. According to sex, males and females had prevalence values of 18(15.7)& 20(17.4) and 17(9.2)& 16(8.6)respectively and 52.9% (36 out of 68) respectively (Table 1). Table 2 shows the prevalence based on risk factors. Children who do not wash hands with soap after playing/touching soil and children who had not been dewormed for the past three months recorded a statistically significant prevalence (*P* =05).3.

4. DISCUSSION

Soil transmitted helminths and *H. pylori* are considered the most common infectious agents affecting human beings in developing countries [21]. In our study, soil transmitted helminths and *H. pylori* were detected in 36(12.0%) and 35(11.7%) of the 300 school aged children tested. This indicates a relatively low prevalence rate in the study population. Some scholars in similar studies reported comparable results.38.3% prevalence rate was reported by Abduraheem et al [22]. A similar study conducted in among school age children in Ethiopia reported a prevalence rate of 23.3% co infection rate [23].However higher prevalence rate was published in a similar work in Mexico with STH infection 44.3% and 48.3 for H. pylori infection. These variations may be due to environmental distinctiveness, life style of the study population and the endemicity of the infectious agents in the different study populations.

In this study we recorded an insignificant relationship between sex and prevalence of STH and H.pylori. This observation was made in similar studies carried out were prevalence rates based on sex were statistically not different.[5,24]. However a similar study reported a significant association between prevalence and gender were males had a higher infection rate than females [25].

The risk factors for both *H. pylori* and STH have similarities in terms of factors associated with hygiene, environmental contaminations and socioeconomic status. While an exact transmission mechanism of *H. pylori* is unknown, it is postulated to be transmitted via person to person or oral-fecal routes similar to many intestinal parasites [24,25,26]. In this study, practicing proper and regular hand washing practice and regular deworming exercise were the risk factors observed to significantly influence the rate of transmission among school age children. similar findings were reported in related studies were poor hygiene as it relates hand washing, living in rural setting and drinking contaminated water were reported to significantly contribute to transmission of infection. [5,22, 27,28].

Table 1. Prevalence based on socio dermographic factors among the study population

Factor /Parameter	Number Examined	Number Positive (%) H *pylori* STH AL TT HW
Overall	300	35(11.7) 37(12.3) 11(3.6) 18(6.0) 8(2.7)
Age Group		
1-5	85(28.3)	12(34.3) 11(29.7) 3(27.2) 5(27.8) 2(25.0)
6 -10	65(21.7)	8 (22.9) 7(19.0) 2(18.2) 3(16.7) 3(37.5)
11-15	55(18.3)	6(17.1) 11(29.7) 4(36.4) 6(33.3) 1(12.5)
16-18	95(31.7)	9(25.7) 8(21.6) 2(18.2) 4(22.2) 2(25.0)
Sex		
MALE	115	18(51.4) 21(56.8) 6(54.5) 11(61.1) 3(42.9)
FEMALE	185	17(48.6) 16(43.2) 5(45.5) 7(38.9) 4(57.1)

Legends: STH: Soil-transmitted helminths;; STH; AL: Ascaris lumbricoides; TT: Trichuris trichiura; HW: Hookworm; p =05

Table 2. Prevalence based on associated risk factors in study population

	Number Examined (%)	*Helicobacterpylori (%)*	STH(%)	Chi-Square (χ^2)	p-value
Wash hands with soap after toilet					
Yes	80 (26.7)	10 (12.5)	9 (11.3)	0.33	0.5657
No	220(73.3)	25 (11.4)	28 (12.7)		
Wash hands with soap after playing/touching soil					
Yes	65 (21.7)	18 (27.7)	8 (12.3)	6.77	0.0093*
No	235 (78.3)	17 (7.2)	29 (12.3)		
Wash fruits and vegetables before eating					
Yes	35 (11.7)	9 (25.7)	10 (28.6)	0.06	0.8065
No	265 (88.3)	26 (9.8)	27 (10.2)		
Deworm in the last three months					
Yes	100 (33.3)	17 (17.0)	6 (6.0)	7.85	0.0051*
No	200 (66.7)	18 (9.0)	31 (15.5)		
Wears footwear outside the house					
Yes	45 (15.0)	20 (44.4)	19 (42.2)	0.24	0.6242
No	255 (85.0)	15 (5.9)	18 (7.1)		

*Legends: STH: Soil-transmitted helminths; *: p=05*

5. CONCLUSION

The findings of this study should be viewed in light of the study's limitations, which include the cross-sectional design and sampling method. In the assessment of when infections occur in relation to the exposure or multiple risk factors assessed by the questionnaire, there is temporal uncertainty. Furthermore, the study is hampered by the fact that it only used one stool sample to determine intestinal parasite infection, perhaps underestimating the true prevalence. However, to boost the sensitivity of parasite detection, we applied multiple diagnostic procedures (i.e., direct microscopy and formol ether concentration technique) as advised in the literature. However, it is recommended that preventive actions be taken to enhance hygienic practises among school-aged children in order to promote health.

CONSENT

Written/oral informed consents were obtained from all participants (from parents for participants <18 years).

ETHICAL APPROVAL

Ethical approval was sought and obtained from the Rivers State Health Management Board.

ACKNOWLEDGEMENTS

We wish to thank Dr Paul Otaru who carried out the statistical analysis and Laboratory Scientists who assisted in analysis of samples

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Jayalakshmi S, Dharanidevi S: The Prevalence of Intestinal Parasitic Infections in a tertiary care hospital in southern India-A retrospective study. Int J Curr Microbiol App Sci. 2016;5(10):718–23.

2. Hannah Spotts, Sosina Walelign, Mehret Tesfaye, Kassu Desta, Aster Tsegaye, Bineyam Taye.concorent infection of intestinal parasites and Helicobacter pylori among school age children in Central Ethiopia Parasite Epidemiol Control; 2020. DOI:10.1016/j.parepi.2020.e00177 PMCID:
3. M. N. Wogu, E. O. Onosakponome and U. A. Harry .Prevalence of Geohelminths among Primary School Children in Edoh Community, Esit Eket Local Government Area, Akwa Ibom State, Nigeria Asian Journal of Medicine and Health. 2020; 18(9)123-127
4. Wongstitwilairoong B, Srijan A, Serichantalergs O, et al. Intestinal parasitic infections among pre-school children in Sangkhlaburi, Thailand. Am J Trop Med Hyg. 2007;76(2):345–350.
5. Gboeloh LeBari Barine and Adedokun Amudatu Ambali. Occurrence osf soil transmitted Helminths, Pylori H. Among occupants of a public social welfare home in Port Hacourt Metropolis Rivers State Nigeria:East African Scholar. J. Med. Sci 2021;4(7)12-19.
6. Thompson RCA, Ash A .Molecular epidemiology of Giardia and Cryptosporidium infections. Infect Genet Evol. 2016;40:315–323
7. World Health Organization (WHO). Diarrhoeal diseases: WHO fact sheet on diarrhoeal diseases; 2017. Available:http://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease. Accessed 15 Sept 2018
8. Harhay MO, Horton J, Olliaro PL. Epidemiology and control of human gastrointestinal parasites in children. Expert Rev Anti Infect Ther. 2010;8(2): 219–234
9. Mortimer L, Chadee K. The immunopathogenesis of Entamoeba histolytica. Exp Parasitol. 2010;126(3): 366–380
10. Bachur TP, Vale JM, Coêlho IC, et al. Enteric parasitic infections in HIV/AIDS patients before and after the highly active antiretroviral therapy. Braz J Infect Dis. 2008;12(2):115–122
11. Gillespie SH, Hawkey PM: Principles and Practice of Clinical Bacteriology Second Edition. Principles and Practice of Clinical Bacteriology; 2006.
12. Konturek JW.Discovery by Jaworski of Helicobacter pylori and its pathogenetic role in peptic ulcer, gastritis and gastric cancer. J Physiol Pharmacol. 2003;54 Suppl 3:23–41.
13. Lesbros-Pantoflickova D, Corthésy-Theulaz I, Blum AL. Helicobacter pylori and probiotics. J Nutr. 2007;137(3 Suppl 2):812S–8S.
14. Yakoob J, Jafari W, Abid S, Tafari N, Hamid S, Shah HA, Rizvi L, Islam M, Shaikh H.Giardiasis in patient with dyspeptic symptoms. World J Gastroenterol. 2005;11(42):6667–66705.
15. Torres J, Perez GP, Ximenez C, Mun˜oz L, Camorlinga-Ponce M, Ramos F, Gomez A, Mun˜oz O. The association of intestinal parasitosis and Helicobacter pylori infection in children and adults from a Mexican community with high prevalence of parasitosis. Helicobacter. 2003;8:179–185
16. Moreira ED Jr, Nassri VB, Santos RS, Matos JF, de Carvalho WA, Silvani CS, Santana e Sant'ana C. Association of Helicobacter pylori infection and giardiasis: Results from a study of surrogate markers for fecal exposure among children. World J Gastroenterol. 2005;11:2759–2763
17. Marini E, Maldonado-Contreras AL, Cabras S, Hidalgo G, Buffa R, Marin A, Floris G, Racugno W, Pericchi LR, Castellanos ME, Gro¨schl M, Blaser MJ, Domı´nguez-Bello MG .Helicobacter pylori and intestinal parasites are not detrimental to the nutritional status of Amerindians. Am J Trop Med Hyg. 2007;76:534–540
18. Zeyrek D, Zeyrek F, Cakmak A, Cekin A .Association of Helicobacter pylori and giardiasis in children with recurrent abdominal pain. Turkiye Parazitol Derg. 2008;32:4–7
19. Escobar-Pardo ML, de Godoy AP, Machado RS, Rodrigues D, Fagundes Neto U, Kawakami E. Prevalence of Helicobacter pylori infection and intestinal parasitosis in children of the Xingu Indian Reservation. J Pediatria. 2011;11:87–105.
20. Sabah AA, Gneidy MR, Saleh NM .Prevalence of Helicobacter pylori infection among adult patients with different gastrointestinal parasites in Tanta City district. J Egypt Soc Parasitol. 2015; 45:101–106
21. Abdurahaman Seid, Zemenu Tamir, Brhanu Kasanew and Moges Senbetay. Co-infection of intestinal parasites and Helicobacter pylori among upper gastrointestinal symptomatic adult patients attending Mekanesalem Hospital,

northeast Ethiopia. BMC Res Notes. 2018;11:144
https://doi.org/10.1186/s13104-018-3246-4

22. SosinaWalelign B, MehretTesfaye B, Kassu Desta B, Aster Tsegaye B, Bineyam Taye A. Concurrent infection of intestinal parasites and Helicobacter pylori among school-age children in Central Ethiopia .Parasite Epidermiol Control; 2020.
DOI:10.1016/j.parepi2020.e00177
23. Yasir Yousif Abd Elbagi, Ahmed Bakheet Abd Alla , Mohammed Baha Eldin Saad .The relationship between Helicobacter pylori infection and intestinal parasites in individuals from Khartoum state, Sudan: a case-control study F1000Research. 2019; 8:2094
Available:https://doi.org/10.12688/f1000research.21397.1)
24. Ankarklev J, Hestvik E, Lebbad M, Lindh J, Kaddu-Mulindwa DH, Andersson JO, Tylleskar T, Tumwine JK, Svard SG. Common coinfections of Giardia intestinalis and Helicobacter pylori in non-symptomatic Ugandan children. PLoSNegl. Trop. Dis. 2012;6:e1780.
25. Sabet EA, El-hadi HA, Mohamed DS, Sheneef A, Fattouh M, Esmat MM. “Gastritis; Helicobacter pylori or Giardia lamblia infection or both”. Egyptian J Med Microbiol. 2009;18(4):165–78.
26. Fuenmayor-Boscán AD, Hernández IM, Valero KJ, Paz AM, Sanrea LB, Rivero Z. Association between helicobacter pylori and intestinal parasites in an Añu indigenous community of Venezuela. Indian J. Gastroenterol. 2016; 35:106–112
27. Awuku YA, Simpong DL, Alhassan IK, Tuoyire DA, Afaa T, Adu P. Prevalence of helicobacter pylori infection among children living in a rural setting in subSaharan Africa. BMC Public Health. 2017;17:360-366
28. Hernández PC, Morales L, Chaparro-Olaya J, Sarmiento D, Jaramillo JF, et al. Intestinal parasitic infections and associated factors in children of three rural schools in Colombia. A cross-sectional study. PLoS One. 2019;14:e0218681.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/81640