(RESEARCH ARTICLE)

Check for updates

Detection of helicobacter pylori by urea breathe test in a Nigerian population with upper gastrointestinal symptoms

Sarah Abere [1, *], Boma Oyan [1] and Okeke Uchenna [2]

[1] Department of Internal medicine, faculty of clinical sciences, Rivers State university/Rivers State university teaching hospital Nigeria.
[2] Department of Internal medicine, faculty of clinical sciences, University of Port Harcourt/University of Port Harcourt Teaching Hospital, Nigeria.

Abstract

Background: *Helicobacter Pylori*, a class one carcinogen is common globally with about 50% of the world's population affected. It causes severe symptoms and complications including peptic ulcer disease and gastric cancer in infected persons. This study therefore aimed to determine the prevalence of *Helicobacter Pylori* as well as the clinical profile of patients with upper gastrointestinal symptoms seen at the Rivers State University Teaching hospital.

Methodology: One hundred consecutive patients with upper GI symptoms undergoing Urea Breath test who fulfilled the inclusion criteria constituted the study population. The data was analyzed using IBM-SPSS Statistics for Windows, Version 22.0.   Results were presented as means ± standard deviation and percentages/number for quantitative and qualitative variables respectively, while Categorical variables were compared with Pearson's Chi-square.

Result: Of the one hundred patients studied, 35 (35%) were males and 65 (65%) were females with a mean age of 49.56 ±14. 68. The prevalence of *Helicobacter pylori* was 33% affecting more females than males. The most common symptoms in the patients at presentation were heartburn (51%), epigastric pain (47%) and dyspepsia (35%). There was an insignificant positive correlation between the detection of *Helicobacter pylori* and a prior exposure to proton pump inhibitors.

Conclusion: There is a high prevalence of *Helicobacter pylori* among patients with upper gastrointestinal symptoms. This buttresses the need for testing and treatment among Nigerians who present with such symptoms.

Keywords: *Helicobacter pylori*; Urea Breath Test; Gastrointestinal symptoms; Dyspepsia

1. Introduction

*Helicobacter pylori (*H pylori) is a gram negative aerotolerant organism usually acquired in childhood that has infected over 50% of the world's population. (1) It is a class 1 carcinogen that produces varied disease conditions in its carriers with severe symptoms occurring in 17% of infected persons, and about 30million exposed individuals could experience one or more severe complications from its infection. (1)The diagnosis of *H pylori* could be both invasive and noninvasive which is more convenient and desirable. Urea breath test (UBT), a noninvasive technique is often considered as the gold standard test in the diagnosis of *H. pylori* infection. (2–4) The UBT is a noninvasive, easy to use method of diagnosing *H pylori* especially in cases where endoscopy is contraindicated with sensitivity and specificity greater than 90% (5) and its high sensitivity makes it a useful tool in detecting *H pylori* colonization even in its most modest form. The UBT is the

---

* Corresponding author: Abere Sarah.

most accurate noninvasive method for diagnosis and is highly effective in the post treatment evaluation of *H pylori* eradication, identification of active gastritis and diagnosis of *H pylori* in Pediatric cases. (6–8) It is comparatively affordable, produces result in real time and is superior to the stool antigen test whether polyclonal or monoclonal though the latter is a better screening tool. (9)

The prevalence of *H pylori* in Africa is about 70% (10) and the prevalence of *H pylori* varies from one geographical region to the other depending on age, race, geographical region, associated diseases, socio-economic status, hygienic conditions, level of literacy and diet. (9,11) Additionally, the outcome of infection with *Helicobacter pylori* depends on the interplay between the host and the bacterium. A recent meta-analysis of 224 studies from 71 countries showed a significant decline in the global prevalence of *H pylori* within a period of 4 decades from 58.2% to 43.1% especially in the African region. (12)

The reported prevalence of *H pylori* among patients with upper gastrointestinal disorders such as dyspepsia in Nigeria ranges from 73% to 94.5% and is associated with low socioeconomic status, poor standard of living, poor personal and environmental hygiene, presence of *H. pylori*-positive family members and increasing age. (13–16) Some authors have also described other factors such as smoking, sources of drinking water, overcrowding, Patronizing of roadside food vendors, extent of education and levels of interferon gamma as factors associated with a high burden of *H pylori*. (17–19) Despite the high prevalence of *H pylori* in Nigeria, little or no research has been done in the south-south region of the country and the few reported ones were mainly serological tests which are low in sensitivity and specificity.(6,20,21) The aim of this study is to determine the prevalence of *H pylori*, including the characteristics and clinical presentations of patients with upper gastrointestinal symptoms seen at the Rivers state University Teaching Hospital (RSUTH).

2. Methodology

This cross-sectional study was carried out at the gastroenterology clinic of the Rivers State university teaching hospital (RSUTH), Port Harcourt, Nigeria. Consecutive patients with upper gastrointestinal symptoms undergoing Urea Breathe Test (UBT) between February 2023 and January 2024 were recruited into the study after an informed consent has been obtained. Baseline biodata was obtained and Patients who were previously treated for *H. pylori* infection and/or who had received antibiotics, proton pump inhibitors or bismuth compounds in the preceding 4 weeks were excluded.

Diagnosis of *H pylori* was made by using the MSL Dual Channel *Helicobacter Pylori* 14C Breath Test/Diagnose *H. Pylori* Infection Machine® after oral administration of the urea capsules and following 4-6 hours fast.

Ethical clearance was secured from the joint Ethical committee of the Rivers State University and RSUTH (RSUTH/REC/2023216).

Data was analyzed with IBM-SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Results were presented as means ± standard deviation and percentages/number for quantitative variables and qualitative variables respectively. Categorical variables were compared with Pearson's Chi-square. Significant P-value was taken as <0.01.

3. Results

One hundred patients with upper gastrointestinal symptoms were evaluated and had Urea breathe test for the identification *H pylori*. There were 35(35.0%) males and 65(65.0%) females with a ratio of 1: 1.86. Their age ranged from 19 to 82 years with a mean age of 49.56±14.68 and they were classified according to the standard age group as Young: 37(37.0%), Middle aged: 48(48.0%) and Elderly:15(15.0%) respectively.

The most common symptom among the patients was heartburn (51%) as shown in Figure 1 while 10% of the patients complained of weight loss.

Helicobacter pylori was detected in 33 (33%) of the patients by urea breathe test while 33% and 70 (70%) had received treatment with either the first line triple regimen and/ or a proton pump inhibitor at least once in their lifetime.

More females (20[60.6%]) than males (13[39.9%]) were diagnosed *H pylori* positive and among the different age groups, *H pylori* was detected more in the middle-aged patients (19, 57.6%) than others. (see table 1)
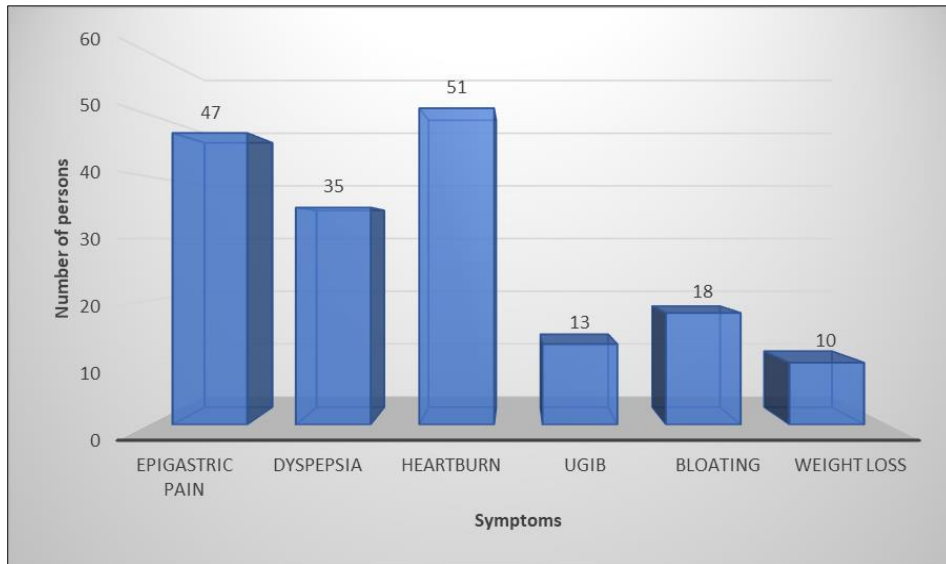
Figure 1 Distribution of symptoms

Table 1 Correlation of UBT with age and sex

Category	UBT positive N(F%)	UBT negative N (F%)	Chi square (p-value)
	SEX		
Male	13(39.4)	22(32.8)	o.418(0.656)
Female	20(60.6)	45(67.2)	
	AGE GROUP		
Young	9(27.3)	28(41.8)	2.201(0.333)
Middle age	19(57.6)	29(43.3)	
Elderly	5(15.2)	10(14.9)	
Total	33(100)	67(100)	

The relationship between previous proton pump exposure of at least once in a lifetime and UBT positivity was determined and 75.8% of patients who had been previously treated tested positive for *H pylori* though this was not significant. (see table 2)

Table 2 Correlation of PPI exposure and UBT result

Prior PPI exposure	UBT Positive Frequency (%)	UBT negative Frequency (%)	Chi square (p value)
Yes No	25(75.8) 8(24.2)	45(67.2) 22(32.8)	0.777 (0.378)
Total	33(100)	67(100)	

4. Discussion

This urea breathe Test-based study yielded a prevalence of *H pylori* of thirty-three percent among one hundred patients with upper gastrointestinal symptoms referred to the gastroenterology clinic at the Rivers State University Teaching Hospital (RSUTH). Similar but higher values have been reported by other investigators in Nigeria and this may be due to differences in diagnostic modalities and geographical location. (10,13,16,22,23) Most studies conducted in

comparable regions of the study site *are H pylori* serology studies and the Prevalence rates range from 30.9% (24) in the south-south region to 51.4% (25) in the south-east region.

In their 3 year cross-sectional study of 203 dyspeptic patients assessed with the UBT, Abiodun et al (23) reported a *H pylori* prevalence of 52.2%, and a higher prevalence (56.2%) was observed in the female gender compared to the male gender. The same gender disparity was observed in this study as *H pylori* was detected in 60.6% of the female population in contrast to 39.9% of the male patients.

The most common identifiable clinical symptoms in the patients at presentation were heartburn (51%), epigastric pain (47%) and dyspepsia (35%) and Identical symptomatology and pattern of presentation has also been reported by other researchers. (26,27)

The urea breathe test is considered the gold standard in *H pylori* diagnosis and consistently produces more accurate results when compared to the other methods. (28) The UBT has an advantage over the endoscopic urease test and histology test as the latter can be affected by biopsy sampling errors, pathologists experience and the sensitivity of the test kit. Furthermore, despite the noninvasive nature and high sensitivity/ specificity of the UBT, several limitations to its use exist. These include the need for specialized training for the administrator, cost of acquisition of the equipment, and the alteration of results by recent use of medications such as antibiotics, proton pump inhibitors, bismuth etc.

5. Conclusion

In conclusion, this study confirms a high prevalence of *H. pylori* among patients with upper gastrointestinal symptoms, and a strong correlation of gender disparity in the detection of *H. pylori*. However, the use of the urea breathe test in the detection of H. *pylori* infection is limited by its expensive nature and sparse availability in sub-Saharan Africa. Additionally, this study was conducted in a highly specialized center and may not depict an accurate burden of *H pylori* infection in Nigeria.

The high prevalence of *H pylori* among patients with upper gastrointestinal symptoms further buttresses the need for testing and treatment among Nigerians who present with such symptoms.

Compliance with ethical standards

Acknowledgments

Disclosure of conflict of interest

The authors declare no conflict of interest.

References

[1] Huang Y, Wang QL, Cheng DD, Xu WT, Lu NH. Adhesion and Invasion of Gastric Mucosa Epithelial Cells by Helicobacter pylori. Front Cell Infect Microbiol. 2016;6:159.

[2] Perri F. Diagnosis of Helicobacter pylori infection: which is the best test? The urea breath test. Dig Liver Dis Off J Ital Soc Gastroenterol Ital Assoc Study Liver. 2000 Dec;32 Suppl 3:S196-198.

[3] Graham DY, Klein PD. Accurate diagnosis of Helicobacter pylori. 13C-urea breath test. Gastroenterol Clin North Am. 2000 Dec;29(4):885–93, x.

[4] Parente F, Bianchi Porro G. The (13)C-urea breath test for non-invasive diagnosis of Helicobacter pylori infection: which procedure and which measuring equipment? Eur J Gastroenterol Hepatol. 2001 Jul;13(7):803–6.

[5] Gisbert JP, Pajares JM. Review article: 13C-urea breath test in the diagnosis of Helicobacter pylori infection -- a critical review. Aliment Pharmacol Ther. 2004 Nov 15;20(10):1001–17.

[6] Patel SK, Pratap CB, Jain AK, Gulati AK, Nath G. Diagnosis of Helicobacter pylori: What should be the gold standard? World J Gastroenterol WJG. 2014 Sep 28;20(36):12847–59.

[7]   Koletzko S. Noninvasive diagnostic tests for Helicobacter pylori infection in children. Can J Gastroenterol J Can Gastroenterol. 2005 Jul;19(7):433–9.

[8]   Zagari RM, Pozzato P, Martuzzi C, Fuccio L, Martinelli G, Roda E, et al. 13C-urea breath test to assess Helicobacter pylori bacterial load. Helicobacter. 2005 Dec;10(6):615–9.

[9]   Sabbagh P, Mohammadnia-Afrouzi M, Javanian M, Babazadeh A, Koppolu V, Vasigala VR, et al. Diagnostic methods for Helicobacter pylori infection: ideals, options, and limitations. Eur J Clin Microbiol Infect Dis. 2019 Jan 1;38(1):55–66.

[10]   Smith S, Fowora M, Pellicano R. Infections with Helicobacter pylori and challenges encountered in Africa. World J Gastroenterol. 2019 Jul 7;25(25):3183–95.

[11]   Malfertheiner P, Camargo MC, El-Omar E, Liou JM, Peek R, Schulz C, et al. Helicobacter pylori infection. Nat Rev Dis Primer. 2023 Apr 20;9(1):19.

[12]   Li Y, Choi H, Leung K, Jiang F, Graham DY, Leung WK. Global prevalence of Helicobacter pylori infection between 1980 and 2022: a systematic review and meta-analysis. Lancet Gastroenterol Hepatol. 2023 Jun;8(6):553–64.

[13]   Ndububa DA, Agbakwuru AE, Adebayo RA, Olasode BJ, Olaomi OO, Adeosun OA, et al. Upper gastrointestinal findings and incidence of Helicobacter pylori infection among Nigerian patients with dyspepsia. West Afr J Med. 2001;20(2):140–5.

[14]   Pounder RE, Ng D. The prevalence of Helicobacter pylori infection in different countries. Aliment Pharmacol Ther. 1995;9 Suppl 2:33–9.

[15]   Holcombe C, Omotara BA, Padonu MK, Bassi AP. The prevalence of symptoms of dyspepsia in north eastern Nigeria. A random community based survey. Trop Geogr Med. 1991 Apr;43(1–2):209–14.

[16]   Otegbayo JA, Oluwasola OA, Yakubu A, Odaibo GN, Olaleye OD. HELICOBACTER PYLORI SEROLOGY AND EVALUATION OF GASTRODUODENAL DISEASE IN NIGERIANS WITH DYSPEPSIA. Afr J Clin Exp Microbiol. 2004 Jun 17;5(1):131–8.

[17]   Bello, Ahmad Kumo, Umar AliBala, Borodo, Musa. (2018). Prevalence and risk factors for helicobacter pylori infection in gastroduodenal diseases in Kano, Nigeria. African Journal of Medical and Health Sciences. 17. 41. 10.4103/ajmhs.ajmhs_36_17 [cited 2024 Apr 28].

[18]   Daniyan O, Ibe B, C E, Ubah O, Ezeanosike O, N O. Seroprevalence and Risk Factors of Helicobacter Pylori Infection Among Children in South-East Nigeria: Daniyan Olapeju W et al. Seroprevalence and Risk Factors of Helicobacter Pylori. J Gastroenterol Hepatol Res. 2020 Jan 1;9:3066–70.

[19]   Galal YS, Ghobrial CM, Labib JR, Abou-Zekri ME. Helicobacter pylori among symptomatic Egyptian children: prevalence, risk factors, and effect on growth. J Egypt Public Health Assoc. 2019 May 24;94(1):17.

[20]   Patel K, Sebastiani G. Limitations of non-invasive tests for assessment of liver fibrosis. JHEP Rep Innov Hepatol. 2020 Apr;2(2):100067.

[21]   Smith SI, Ajayi A, Jolaiya T, Onyekwere C, Setshedi M, Schulz C, et al. Helicobacter pylori Infection in Africa: Update of the Current Situation and Challenges. Dig Dis Basel Switz. 2022;40(4):535–44.

[22]   Olokoba AB, Gashau W, Bwala S, Adamu A, Salawu FK. Helicobacter Pylori Infection in Nigerians with Dyspepsia. Ghana Med J. 2013 Jun;47(2):79.

[23]   Abiodun Christopher J, Jesse Abiodun O, Samuel Olawale O, Olayiwola Abideen O, Adegboyega A. Prevalence of helicobacter pylori among Nigerian patients with dyspepsia in Ibadan. Pan Afr Med J. 2010 Sep 19;6:18.

[24]   Etukudo OM, Ikpeme EE, Ekanem EE. Seroepidemiology of Helicobacter pylori infection among children seen in a tertiary hospital in Uyo, southern Nigeria. Pan Afr Med J. 2012 Jun 21;12:39.

[25]   Chukwuma OM, Chukwuma G, Manafa P, Ibeh N, Jeremiah Z. Prevalence and Possible Risk Factors for Helicobacter Pylori Seropositivity among Peptic Ulcerative Individuals in Nnewi Nigeria. J Curr Biomed Res. 2017;1(1):39–45.

[26]   Nwokediuko SC, Ijoma U, Obienu O, Picardo N. Time trends of upper gastrointestinal diseases in Nigeria. Ann Gastroenterol. 2012;25(1):52–6.

[27]   Serra MAAO, Medeiros AT, Torres MD, Dias ICCM, Santos CAAS, Araújo MFM. Correlation between the symptoms of upper gastrointestinal disease and endoscopy findings: Implications for clinical practice. J Taibah Univ Med Sci. 2021 Feb 19;16(3):395–401.

[28]   Patel SK, Pratap CB, Jain AK, Gulati AK, Nath G. Diagnosis of Helicobacter pylori: What should be the gold standard? World J Gastroenterol WJG. 2014 Sep 28;20(36):12847–59.