African Helicobacter & Microbiota Study Group

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HELICOBACTER PYLORI: THE NIGERIAN EXPERIENCE

BY

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- *H. pylori* co-infection
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INTRODUCTION

Helicobacter pylori (H. pylori) is a bacterium that infects the stomach and duodenum (the first part of the small intestine).

It is one of the most common chronic infections worldwide, affecting approximately 43% of the global population (Malfertheiner et al. 2023)

HELICOBACTER PYLORI INFECTION IN NIGERIA

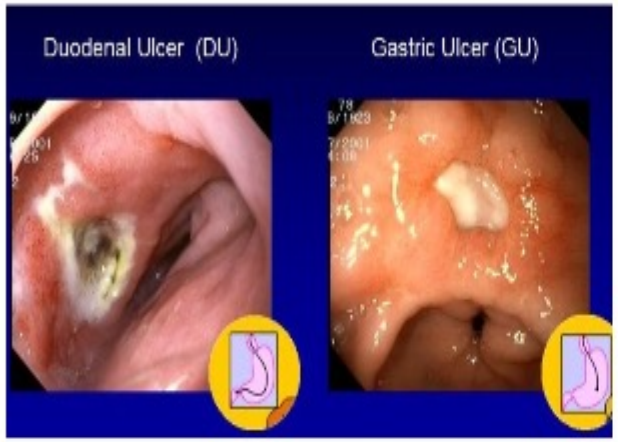
In Nigeria, *H. pylori* infection is highly prevalent, with an estimated 70-80% of the population infected (Palamides *et al*., 2020). This high prevalence is attributed to various factors, including:

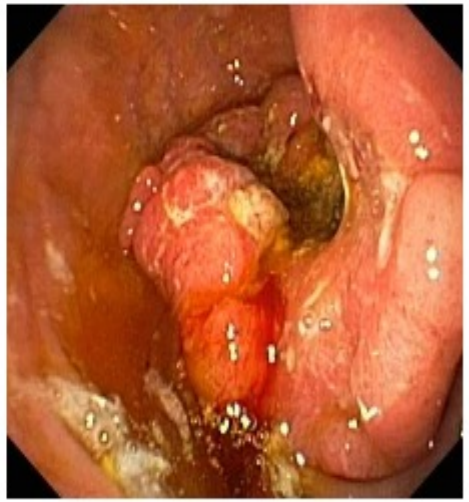
- Poor sanitation and hygiene
- Contaminated food and water
- Overcrowding and poor living conditions
- Low socioeconomic status

(Ishaleku and Ihiabe, 2010; Olufemi *et al*., 2015; Oti *et al*., 2017)

H. pylori infection is a major risk factor for various gastrointestinal disorders, including:

- Peptic ulcer disease
- Gastritis
- Gastric cancer
- MALT lymphoma





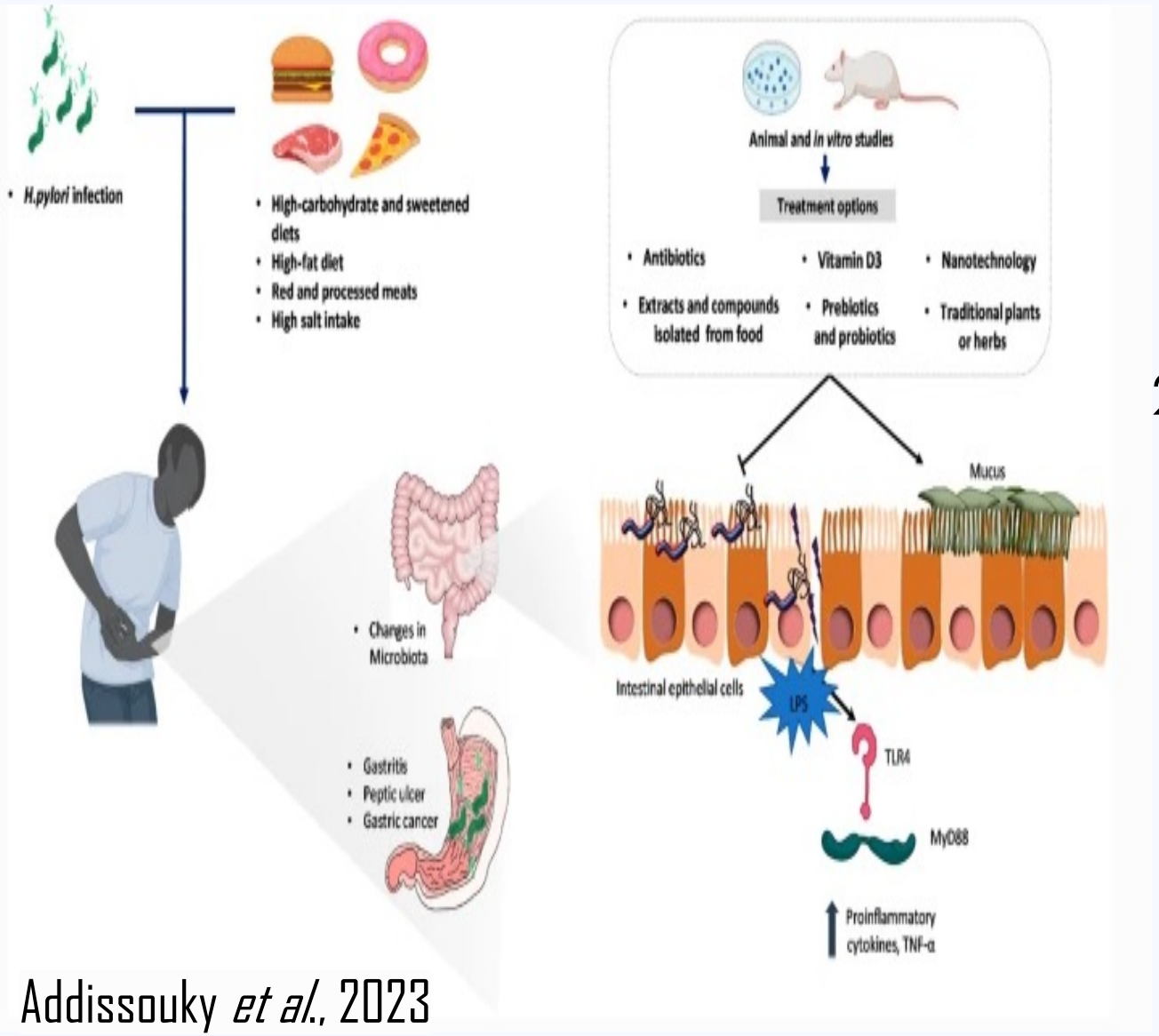
In Nigeria, *H. pylori*-related diseases are a significant public health concern, particularly in rural areas where access to healthcare is limited (Begum *et al*., 2023).

Some interesting facts about *H. pylori* in Nigeria include:

H. pylori infection is more common in rural areas (80-90%) than in urban areas (60-70%).

The prevalence of *H. pylori* infection increases with age, with the highest rates found in people over 40 years old.

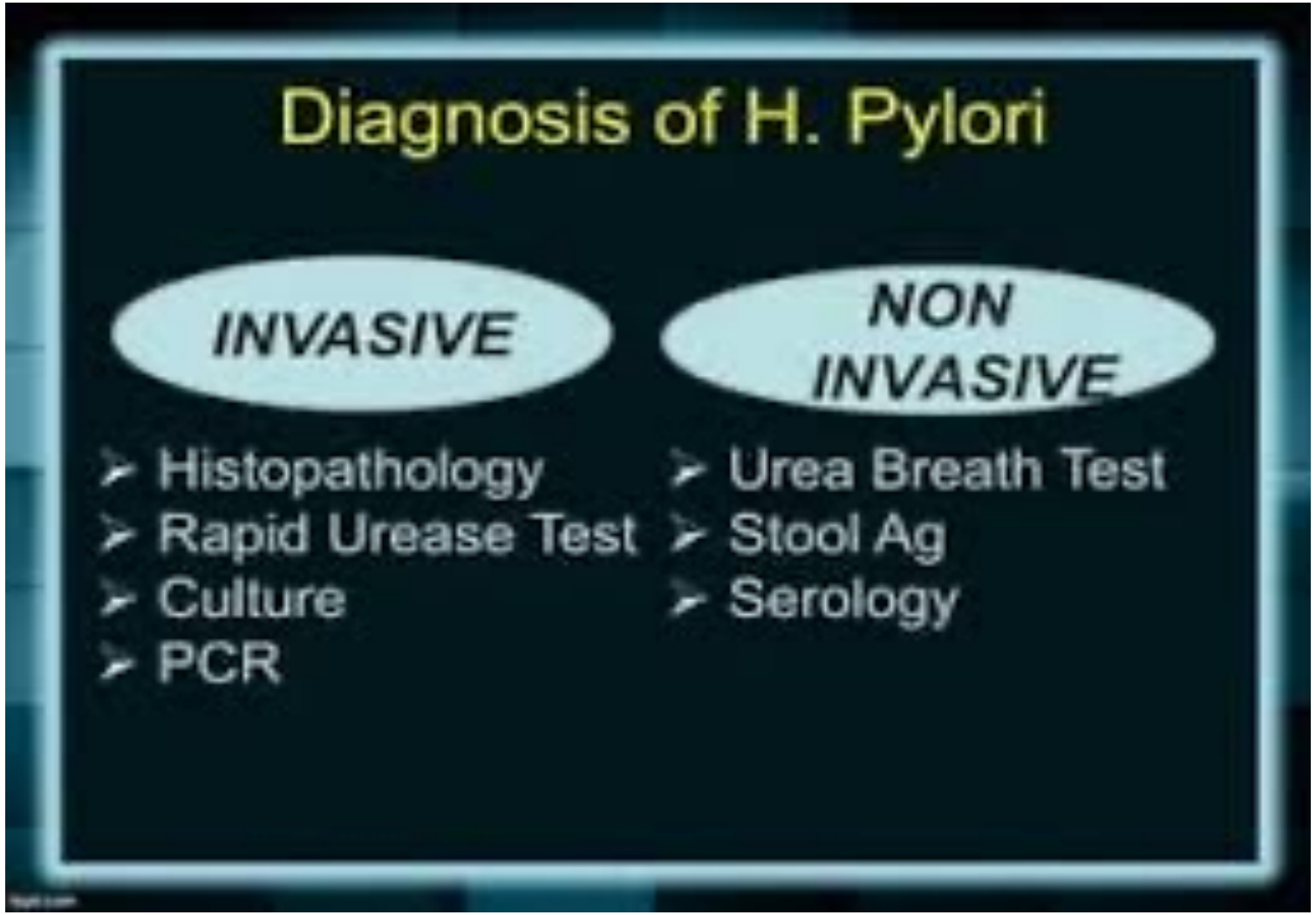
H. pylori-related diseases are a leading cause of morbidity and mortality in Nigeria, particularly among children and young adults (Mbang, 2019; Zawaya *et al.,* 2021).

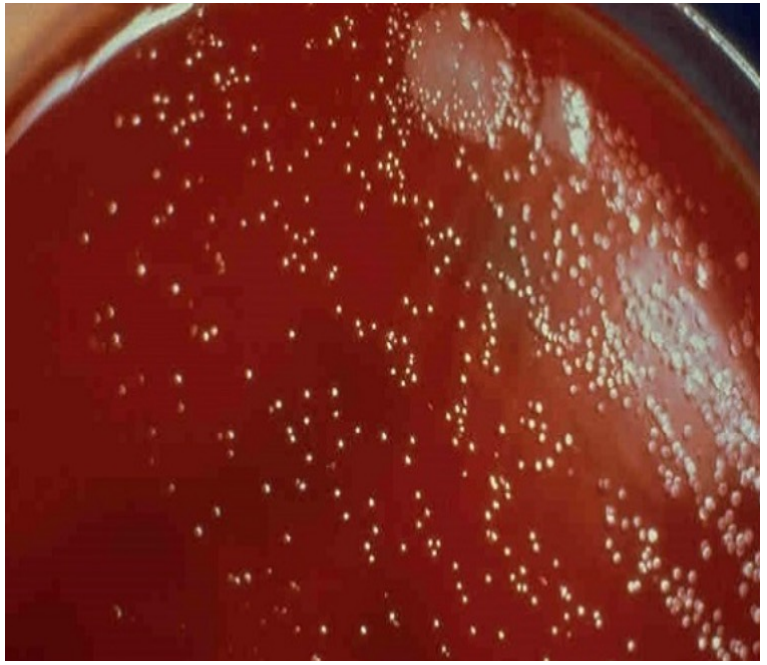


Addissouky *et al.*, 2023

1. Overall, *H. pylori* infection is a significant health burden in Nigeria.
2. Efforts are needed to improve awareness, diagnosis, and treatment of this infection to reduce its impact on public health (Jaka and Smith, 2024).

METHODS OF DIAGNOSIS OF *H. PYLORI*: INVASIVE AND NON-INVASIVE





Smith *et al.*, 2022

H. PYLORI AND INTESTINAL PARASITE CO-INFECTION

- The prevalence rate of *H. pylori* intestinal parasite co-infection amongst children under 16 years was reported by a few authors to range from 10.6% - 35.7%, but this rate was much lower in one report from adults to be 4.76%.
- The most common co-infection with parasites was hookworm, *Ascaris lumbricoides*, *Giardia lamblia* (via PCR).
- *H. pylori* co-infection may have several implications

Eradication of *H. pylori* therefore reduces gastric cancer risk (Malfertheiner et al. 2023)

- Need for early detection and treatment of *H. pylori* infection.

Barne and Ambali (2021), Aniekwe *et al*. (2024), Ogefere et al. (2024)

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Co-infection of *Helicobacter Pylori* and intestinal parasites in children of selected Low-income communities in Lagos State, Nigeria

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ABSTRACT

Helicobacter pylori and intestinal parasites cause gastrointestinal diseases with a high prevalence in children in resource limited developing countries. There is paucity of information in Nigeria on co-infection of *H. pylori* and intestinal parasites. The study was conducted to determine the prevalence of *H. pylori* and parasite co-infection in children from selected low-income communities in Lagos, Nigeria. Fecal samples were collected from 151 healthy children aged ≤11 years across six low-income communities in Lagos. *H. pylori* was detected using stool antigen test and conventional PCR assay, intestinal parasites were detected using formol-ether concentration and nested PCR assay. Structured questionnaires were administered to parents and legal guardians of the children by an interviewer to collect relevant data on demographic and lifestyle factors. The prevalence of *H. pylori* was 31.79% (48), with a higher prevalence in children aged 2–3 years. The prevalence of intestinal parasites was 21.19% (32) with the lowest frequency found in children aged 8–9 years. The parasites detected include: *A. lumbricoides* (10.6%), *G. intestinalis* (7.3%), hookworm (1.99%), *E. histolytica* (0.66%), *S. mansoni* (0.66%). There was co-infection prevalence of 10.6% (16) which was associated with the parasites: *G. intestinalis* (7.3%) and *A. lumbricoides* (3.97%). Polyparasitism with *G. intestinalis* and *A. lumbricoides* was reported in 2 children infected with *H. pylori*. This study which is the first reported in Lagos established a low prevalence of *H. pylori* and intestinal parasite co-infection in children and provides better understanding of the epidemiology of *H. pylori* infection associated with intestinal parasites in Nigeria.

H. PYLORI AND HIV CO-INFECTION

- Global prevalence of *H. pylori*-HIV co-infection was 21.9% for SSA, while a few studies from Nigeria, reported prevalence rate of *H. pylori* co-infection with HIV to range from 26.2% - 58%.
- This information is important for preventive interventions and risk projection of complications such as gastric cancer.
- Need for proper management of *H. pylori* infection in HIV-positive patients to prevent gastric cancer
- Need for regular screening for gastric cancer in HIV-positive patients

Govaresh/ Vol. 21, No.1, Spring 2016; 57-62.

Prevalence of *Helicobacter Pylori* Infection among HIV-1 Infected patients using Stool Antigen Tests in Jos, North-Central, Nigeria

Original Article

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ABSTRACT

Background:
Helicobacter pylori (H. pylori) infection is common among humans and plays a major role in the etiology of peptic ulcer disease with significant morbidity in patients with HIV-1 on antiretroviral therapy. There are conflicting prevalence patterns of *H. pylori* in HIV-1 infected patients using various methods of detection. The noninvasive technique used for detection of *H. pylori* infection is inexpensive and convenient with no complications.

Materials and Methods:
We aimed to determine the prevalence of *H. pylori* infection among patients infected with HIV-1 on antiretroviral therapy using *H. pylori* stool antigen. 139 patients infected with HIV-1 were recruited, stool samples were collected and the *H. pylori* stool antigen (HpSA) test was used to detect *H. pylori* antigen.

Results:
46.8% of the respondents were positive for *H. pylori* and 53.2% were negative. 18 (13%) were men and 47 (33.8%)

microorganisms

MDPI

Article

Helicobacter pylori and Human Immunodeficiency Virus Co-Infection: Potential Implications for Future Gastric Cancer Risk

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Abstract: Objective: *Helicobacter pylori* and human immunodeficiency virus (HIV) are both pandemic infections with variable geographic prevalence rates. *H. pylori*–HIV co-infection at the regional and sub-regional levels with a perspective on gastric cancer incidence is discussed. Design: Based on PRISMA guidelines, national data for *H. pylori*, HIV, and *H. pylori*–HIV co-infection were collected for the general population through December 2019. Joint temporal and geographical data for *H. pylori* and HIV infections in 48 countries were available and used to generate *H. pylori*–HIV co-infection estimates by cross-sectional analysis. These data were compared with gastric carcinoma statistics for the same countries. Results: The estimated global prevalence rate of *H. pylori*–HIV co-infection was 1.7 per 1000 people, representing 12.6 million people. Prevalence according to region was, in decreasing order, sub-Saharan Africa 21.9‰, Eastern Europe/Central Asia 4.3‰, Latin America/Caribbean 2.0 ‰, North America/Western/Southern/Northern Europe 1.1‰, Asia/Pacific 0.8‰, and North Africa/Middle East 0.1 ‰. The incidence and mortality rates for gastric carcinoma were higher in East/Pacific Asia, Southern/Andean Latin America, and Eastern Europe regions, and the incidence

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Research Paper **Open Access**

HIV and *Helicobacter pylori* Coinfections among HIV-Infected Patients in Calabar, Nigeria

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ABSTRACT
This study was carried out to detect anti-HIV and anti-*Helicobacter pylori* coinfection among 191 patients attending the ART clinic in Calabar, Nigeria. Blood samples were collected from 191 subjects and processed using standard laboratory procedures. One Step Anti-HP Rapid detection test kit was used stepwise to detect *H. pylori* antibodies in the blood samples. Commercial ELISA by Dia Pro (Italy) was also used to assay for *H. pylori* among these patients. The overall prevalence of HIV/*H. pylori* coinfection was 26.2%. A higher prevalence occurred in age-group 26-30years (40.0%), females (27.0%), the married (27.8%), those with secondary education (27.7%), teachers (42.1%), CD4 counts 350-499 cells/µl (32.6%) and < 200 cells/µl (32.4%) and viral loads ≥10, 000 copies (43.1%). However, none of the variables evaluated in this study were statistically significant, except for viral loads. The study further confirms the presence of HIV/*Helicobacter pylori* among patients in Calabar, Nigeria. This result emphasizes the need for regular blood testing for *H. pylori* and HIV to reduce transmission among the general population. Extensive health education is required to inform the public about infection risk factors and potential preventative actions. To characterize the function of *H.*

Different Locations in Nigeria with *H. pylori* Co-infection Prevalence

Location	Co-infection	Prevalence	Participants	Reference
Abeokuta	HIV	47.4%	Dyspeptic patients	Ejilude *et al*. (2011)
Jos	HIV	46.8%	HIV positive patient	Okopi *et al*. (2016)
Calabar	HIV	26.2%	HIV positive patient	Innocent-Adiele *et al*. (2023)
Port Harcourt	HIV	58%	Patients attending secondary health facility	Alubi *et al.* (2023)
Port Harcourt	Herpes simplex virus	0%	Patients attending secondary health facility	Alubi *et al.* (2023)
Port Harcourt	Syphilis	0%	Patients attending secondary health facility	Alubi *et al.* (2023)
Rivers	HCV	0%	Pregnant Women	Adim *et al*. (2024)
Rivers	Syphilis	0%	Pregnant Women	Adim *et al*. (2024)
Lagos	Intestinal parasites	10.6%	Children	Aniekwe *et al*. (2024)

VIRULENCE GENES OF *H. PYLORI*

There are several reported virulence genes of *H. pylori* that have been involved in its pathogenicity such as:

Urease (ureA, glmM etc), Flagella, cagPAI (*cag*A, *cag*L etc), *vac*A, *ice*A, *dup*A, Adhesins (*bab*A, *sab*A), *oip*A, *hop*Q

The more virulent isolates are strains that possess *cag*A, *vac*As1,m1,i1d1. However, in Nigeria, several reports on virulence genes showed that most reported strains possess highest virulence factor irrespective of their clinical status (?African Enigma).

These virulence genes collectively enable *H. pylori* to:

- Colonize the gastric mucosa
- Evade host immune responses
- Cause gastric inflammation and damage
- Increase the risk of gastric cancer and other diseases

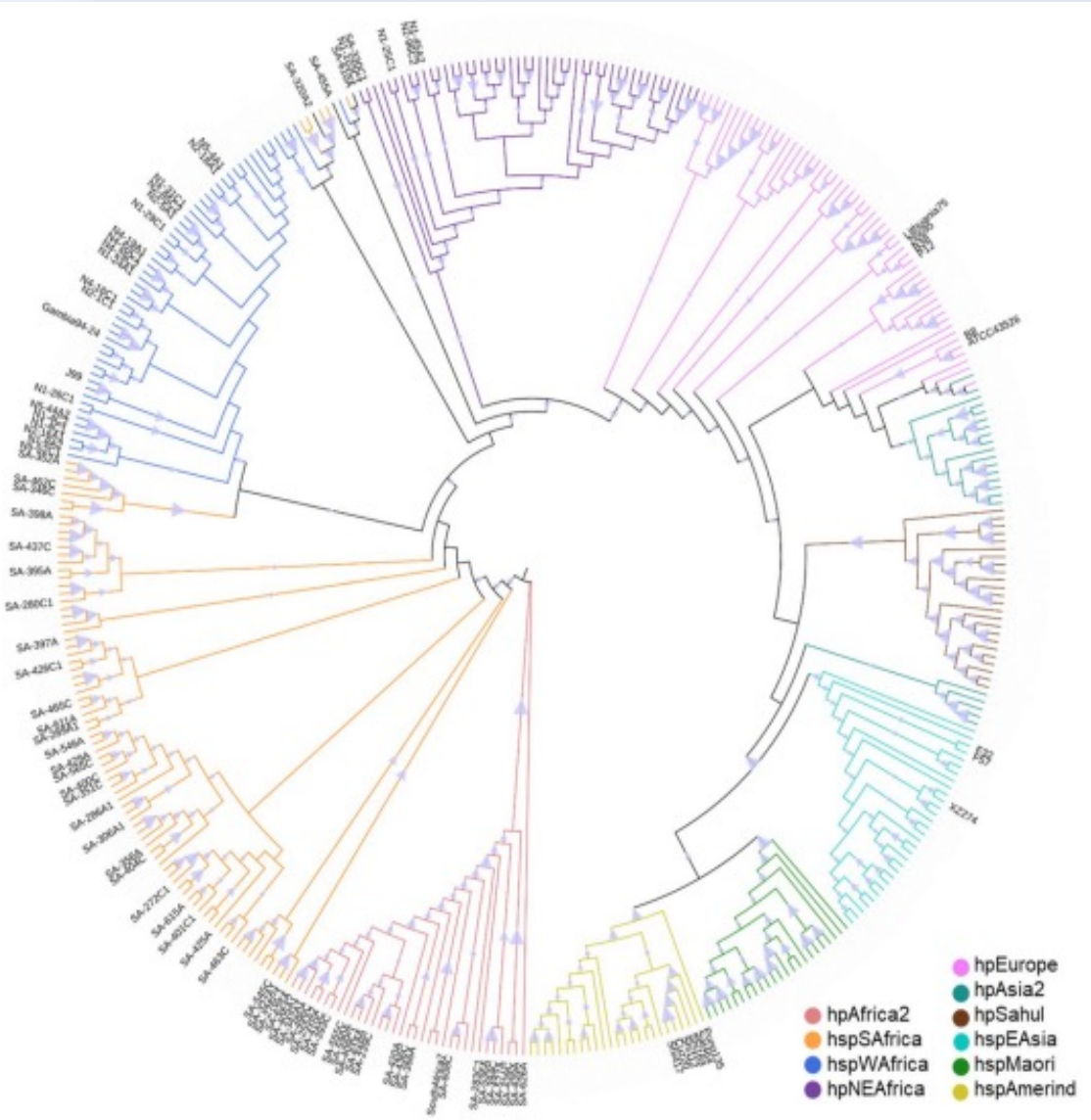
(Harrison *et al.*, 2017; Idowu *et al.*, 2019)

Harrison *et al.* (2017) reported the presence of *vacA and cagA* in 111 Nigerian isolates. Jolaiya *et al*. (unpublished) reported *vac*A, *cag*A, *bab*A, *bab*B, *oip*A in 85 isolates from dyspeptic participants from Nigeria.

Virulence genes	Prevalence	Clinical Outcome	Association of virulence genes with clinical outcome	Reference
VacAs1m1	100%	2 gastric cancer 15.5% ulcer	No association with the virulence genes	Harrison *et al.* (2017)
CagA CagA translocation	100% 100%	2 gastric cancer 15.5% ulcer	Average disease outcome Mostly normal pathology	
CagA	97.6%	25.9% Normal mucosa	(P=0.003) there is association with clinical outcome	Jolaiya *et al.* (unpublished)
VacA	100%	31.8% erosion	No association	
babA	2.4%	14.1% hyperaemia	No association	
babB	68.2%	3.5% Ulcer	No association	

Virulence genes	Prevalence	Clinical Outcome	Association of virulence genes with clinical outcome	Reference
VacAs1m1	82.9%	Erosion 43.6%	No association with the virulence genes	Palamides *et al.* (2020)
VacAs1m2	12.2%	Gastric ulcer 15.4%		
VacAs2m2	2.4%	Cancer 2.6%		
VaCA Westernblot	90.2%			
DupA	82.4%			
CagA	90.2%			
CagA translocation	90.2%			
CagA Western blot	87.8%			

Palamides *et al.* (2020) reported the presence of *vacA*, *cagA* and *dupA* in 114 Nigerian patients.



Palamides *et al.* (2020) by MLST showed that the population classifications vary significantly between Nigerian *H. pylori* strains and South African strains. Most Nigerian strains were of the hspWestAfrica subtype.

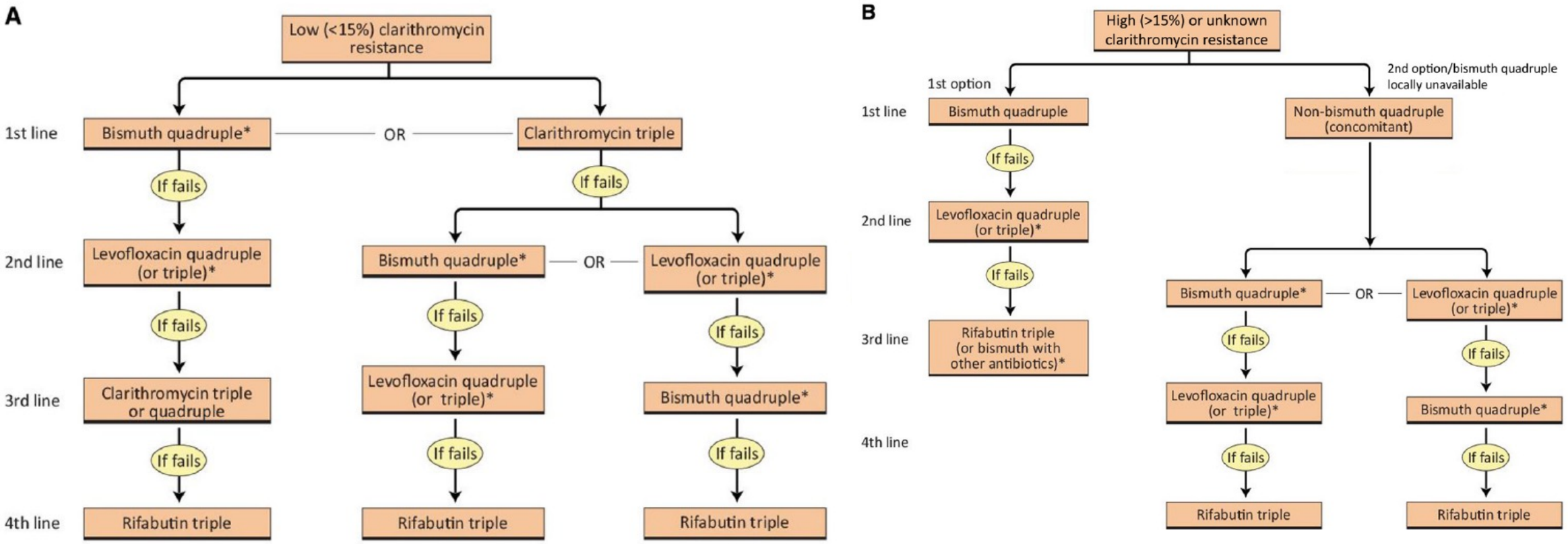
Thorell et al. (2024) by WGS, hspAfrica1NAmerica/MiscAmerica: Ghana and Nigeria

H. PYLORI ANTIBIOTIC RESISTANCE

- In developing countries like Nigeria, antibiotic resistance against commonly used antibiotics is widespread.
- Most of these could be attributable to drug mutations by the bacterium, non-patient compliance, sub-standard drugs as well inappropriate antibiotic use and host genetic make-up of the individual.
- This high antimicrobial resistance poses a danger to the effective treatment and eradication of *H. pylori* infection (Olokoba, 2023).

- Aboderin *et al*. (2007) reported 9/31, 27/31 *H. pylori* resistance to rifampicin and tetracycline, respectively. Five (15.6%) of these isolates showed resistance to ciprofloxacin.
- In a Nigerian cohort of 111 isolates, high bacterial resistance was observed for metronidazole (99.1%), followed by amoxicillin (33.3%), clarithromycin (14.4%), and tetracycline (4.5%) (Harrison *et al*., 2017).
- Resistance rates with the highest rate for metronidazole (NG: 100%) and the lowest for tetracycline (NG: 13%) respectively was reported by Palamides *et al*. (2020) in *H. pylori*

TREATMENT OF H. PYLORI



Malfertheiner et al. 2022

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Table 1. Recommended therapies for *H. pylori* infection

Drug	Frequency	Duration
A. First-line therapies (provided there was no previous exposure to macrolides and local resistance to clarithromycin is <15%)		
Clarithromycin triple[a]		
PPI[b] (standard or double dose)	BID	14 days
Clarithromycin 500 mg	BID	
Amoxicillin 1 g	BID	
B. Salvage therapies		
Concomitant clarithromycin[a]		
PPI[b] (standard dose)	BID	14 days
Clarithromycin 500 mg	BID	
Amoxicillin 1,000 mg	BID	
Nitroimidazole 500 mg	BID	
Levofloxacin triple[a]		
PPI[b] (standard dose)	BID	14 days
Levofloxacin 500 mg	QD	
Amoxicillin 1,000 mg	BID	
Bismuth quadruple		
PPI[b] (standard dose)	BID	10–14 days
Bismuth subcitrate (120–300 mg) or subsalicylate (300 mg)	QID	
Tetracycline (500 mg)	QID	
Metronidazole (250–500 mg)	QID	

[a]Bismuth compounds can be added to these regimens to increase their efficacy. [b]PPI can be replaced with P-CABs when available, as evidence supports the superiority of this drug over PPIs for the eradication of *H. pylori*.

SMITH ET AL 2024

In Nigeria, *H. pylori* infections are usually treated with a combination of antibiotics and a proton pump inhibitor (PPI). Treatment may include:

At least two different antibiotics at once, such as amoxicillin, clarithromycin (Biaxin), metronidazole (Flagyl), tetracycline (Sumycin), or tinidazole (Tindamax)

Proton pump inhibitors (PPIs) like rabeprazole (Aciphex)with amoxycillin and clarithromycin for 7 and 10 days (Onyekwere *et al*., 2014);

Other treatment options occur after empirical failure of the triple therapy and in minor cases following culture results.

Which way forward- Nigeria

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Antimicrobial susceptibility testing for Helicobacter pylori is now widely available: The Who's, When's, and How's

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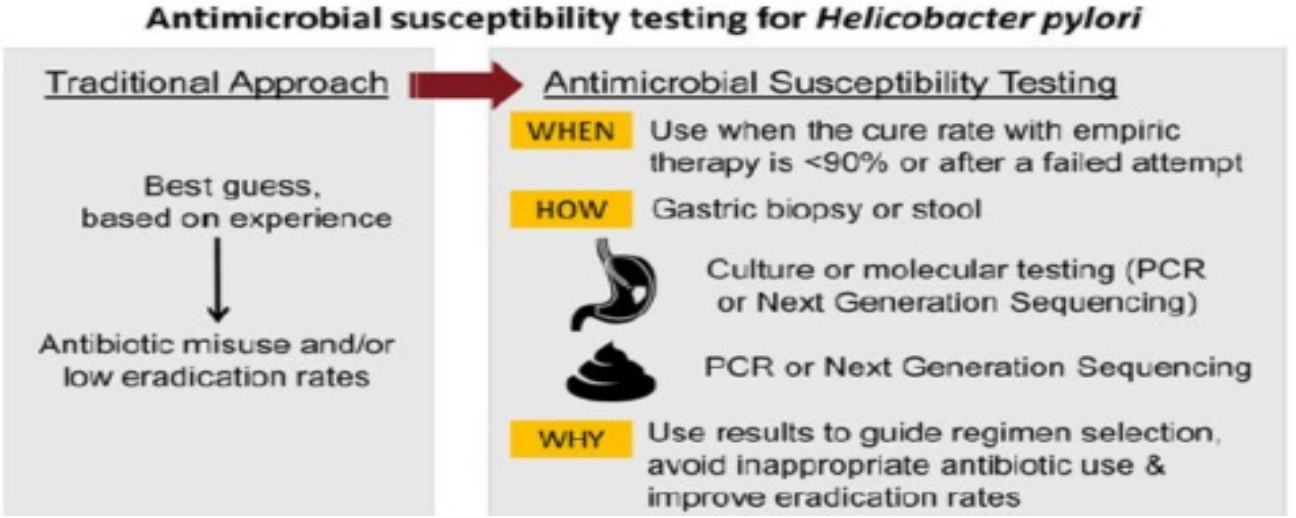
Graphical Abstract



To address the challenges associated with *H. pylori* diagnosis, treatment failure, antibiotic resistance, and eradication in Nigeria, the following steps can be considered:

1. Improve diagnostic tools: Enhance access to endoscopy, histology, culture and breath tests, and consider non-invasive tests like stool antigen tests.

2. Update treatment guidelines: Adopt evidence-based treatment protocols, including quadruple therapy and salvage therapies, and consider personalized treatment approaches (Smith *et al*., 2003; Viazis *et al*., 2022)

3. Antibiotic stewardship: Promote responsible antibiotic use, monitor resistance patterns, and implement strategies to reduce antibiotic misuse.

4. Eradication strategies: Consider mass eradication programs, especially in high-risk populations, and implement public health measures to reduce transmission.

5. Research and development: Encourage studies on *H. pylori* epidemiology, genomics, and vaccine development, and explore alternative treatments like probiotics and herbal remedies (Liu *et al.*, 2024)

6. Health education and awareness: Educate the public about *H. pylori* risks, prevention, and management, and train healthcare professionals on updated guidelines and best practices.

7. Multidisciplinary collaboration: Foster collaboration among gastroenterologists, microbiologists, epidemiologists, and public health experts to address the complex challenges associated with *H. pylori*.

8. Infrastructure development: Improve healthcare infrastructure, including laboratories, endoscopy facilities, and healthcare services, especially in rural areas (Smith *et al*., 2024).

HOLISTIC SOLUTIONS FOR H. PYLORI MANAGEMENT IN NIGERIA/AFRICA

1. Treat Symptomatic patients
2. Centralize antimicrobial susceptibility testing facilities
3. Screening of symptomatic family members
4. Stakeholder involvement

Only one randomized control trial by Onyekwere et al. (2014) has so far been reported in Nigeria. More randomised control trial will be the way to go to enable appropriate treatment, through evidence-based treatment guidelines.

antibiotics

MDPI

Perspective

Helicobacter pylori Infection: Antibiotic Resistance and Solutions for Effective Management in Africa

Mashiko Setshedi [1,*] and Stella I. Smith [2]

CONCLUSION

H. pylori infection is a major contribution to morbidity and mortality rate in Nigeria. There are limited data on the prevalence, diagnostic techniques, antibiotic resistance, eradication effectiveness due to lack of research funding, adequate equipment and research expertise. In the future, the primary research, should focus on combining multiple treatment methods to effectively eradicate *H. pylori* infection. AHMSG has commenced efforts in tacking challenges of *H. pylori* in Nigeria and Africa as a whole.

SELECTED REFERENCES

- Aboderin *et al*. (2007). Antibiotic resistance of Helicobacter pylori from patients in Ile-Ife, South-west, Nigeria. *African health sciences* 7(3):143–147.
- Malfertheiner et al. (2022). Management of *Helicobacter pylori* infection—the Maastricht VI/Florence Consensus Report. *GUT* utjnl-2022-327745. doi: 10.1136/gutjnl-2022-327745
- Olokoba *et al*. (2013). *Helicobacter pylori* infection in Nigerians with dyspepsia. *Ghana Medical Journal* 47(2): 79–81.
- Oreh *et al*. (2021). Prevalence and Determinants of *Helicobacter pylori* Infection among Adult Dyspeptic Patients in Abuja, Nigeria. *West African Journal of Medicine* 38(8):775–784.
- Smith *et al*. (2022). *Helicobacter pylori* infection in Africa: Update of the Current Situation and Challenges. *Digestive Diseases* 40: 535 – 544.

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