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Helicobacter pylori Infection among Patients Seen at Federal Medical Centre Asaba, Delta State: A Comparison of Serological and Faecal Antigen Testing Methods

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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Abstract

Background: *Helicobacter pylori* is a Gram-negative, microaerophilic bacterium that has been established as the primary aetiological agent responsible for chronic gastritis and peptic ulcer disease.
Aim: This study aimed to compare the diagnostic performance of serological testing with faecal antigen testing for the diagnosis of *H. pylori* infection in subjects attending Federal Medical Centre, Asaba. Accurate diagnosis of infection is important for effective management and control.
Methodology: A comparison of the performance of two diagnostic test methods, serology and stool antigen testing, for *Helicobacter pylori* infection was conducted among 397 patients using a prospective cross-sectional study design. Blood and fresh stool samples were collected from eligible patients after consent. Serum samples were tested for *H. pylori* antibodies using a serological method, whereas stool samples were tested for *H. pylori* antigen. The stool antigen method was used as the reference method for assessing the diagnostic performance of serology. Sensitivity, specificity, positive predictive value, negative predictive value, and the level of agreement between the two methods were also analysed.
Results: The age distribution of participants was similar across genders, with a mean age of approximately 38 years. Serology and stool antigen testing showed similar positivity rates of 43.07% and 42.57%, respectively. Using stool antigen testing as the reference method, the serological test showed a sensitivity of 93.5% and specificity of 94.3%, with a positive predictive value (PPV) of 92.4% and a negative predictive value (NPV) of 95.1%. However, Cohen's kappa analysis showed 0.877 (95% CI:0.83-0.92) indicating almost perfect agreement.
Conclusion: The study demonstrated that the serological method showed high diagnostic performance compared with stool antigen testing and may be useful as a screening method for *H. pylori* infection when the serology result is negative. However, stool antigen testing remains useful for confirming active infection because it detects active infection rather than past exposure.

Keywords: Helicobacter pylori; serology; stool antigen test; faecal antigen; diagnostic performance; sensitivity; specificity; predictive value; non-invasive diagnosis.

1. Introduction

Helicobacter pylori is a Gram-negative, microaerophilic bacterium that represents one of the most prevalent infectious agents worldwide (Smith *et al.*, 2022). Since its discovery by Marshall and Warren, *H. pylori* has been established as the primary aetiological agent responsible for chronic gastritis, peptic ulcer disease, gastric mucosa-associated lymphoid tissue (MALT) lymphoma, and gastric adenocarcinoma (Gisbert, 2025; Tiwari *et al.*, 2025). The organism's ability to persist for decades in the hostile gastric environment, coupled with its potential to trigger malignant transformation, underscores the public health importance of accurate diagnosis and effective management (Jemilohun *et al.*, 2020). Globally, *H. pylori* infects approximately 43-48% of the population, although prevalence varies markedly between regions (Li *et al.*, 2023). In Nigeria, numerous studies over the past decade have reported prevalence rates ranging from 20% to 80%, with most estimates exceeding 50% across various geopolitical zones (Smith *et al.*, 2022; Nwankwo *et al.*, 2021). Within Delta State specifically, seroprevalence studies among asymptomatic subjects have confirmed the endemicity of this infection (Omosor *et al.*, 2017).

The clinical management of *H. pylori* infection begins with accurate diagnosis (Malhotra *et al.*, 2025). Diagnostic modalities are broadly categorised into invasive techniques requiring endoscopic biopsy, such as histopathology, rapid urease testing, and culture, and non-invasive methods, including serology, stool antigen testing, and urea breath testing (Gisbert, 2025; Charach *et al.*, 2024). In resource-constrained settings such as Nigeria, non-invasive tests are particularly attractive because of their lower cost, wider availability, and patient acceptability (Malhotra *et al.*, 2025; Mashiko *et al.*, 2024). Recent evidence from Rivers State, Nigeria, has likewise shown that *H. pylori* detection outcomes can vary substantially across serology, stool antigen testing, and PCR, highlighting the importance of evaluating diagnostic methods within the population in which they are used (Meshack *et al.*, 2024). In a Nigerian biopsy-based comparison, diagnostic performance also differed across histological staining methods, indicating that test characteristics depend on the diagnostic approach employed (Umar *et al.*, 2023).

Serological testing, which detects specific IgG antibodies against *H. pylori*, offers the advantages of simplicity, rapid turnaround time, and independence from ongoing infection status (Bosch *et al.*, 2020). Recent evidence suggests that modern immunochromatographic serological tests have improved accuracy, with some studies demonstrating sensitivity as high as 94% for initial diagnosis (Bosch *et al.*, 2020; Abere *et al.*, 2025). However, serology cannot distinguish between current and past infection, as antibodies may persist for months after bacterial eradication, potentially leading to false-positive results and unnecessary treatment (Gisbert, 2025; Charach *et al.*, 2024). Conversely, monoclonal stool antigen testing directly detects *H. pylori* antigens in faecal specimens, indicating active infection and making it suitable for both initial diagnosis and post-eradication confirmation (Gisbert, 2025; Costa *et al.*, 2024). Systematic evaluations have reported stool antigen test sensitivities of 87-97% and specificities exceeding 94%, although performance characteristics vary between commercial assays and study populations (Costa *et al.*, 2024; Alfau *et al.*, 2023). Recent syntheses of international evidence continue to favour tests that identify active *H. pylori* infection, particularly urea breath and validated stool antigen testing, while the role of serology remains dependent on the clinical context and the purpose of testing (Sun *et al.*, 2025; Tang *et al.*, 2026). A 2026 systematic review and meta-analysis further reported high

diagnostic accuracy for serum antibody and stool antigen tests, while noting that performance can vary with population composition and previous infection status (Ichita *et al.*, 2026).

A recent pan-African survey of *H. pylori* management practices identified stool antigen testing as the most commonly employed diagnostic method in Africa (62.3% of respondents), followed by histological examination (Mashiko *et al.*, 2024). In Nigeria specifically, studies have documented alarmingly high antibiotic resistance rates, including metronidazole resistance approaching 91% and clarithromycin resistance exceeding 40%, which complicate treatment decisions and underscore the importance of accurate baseline diagnosis (Chukwudike *et al.*, 2021). Despite the availability of several diagnostic options and evidence from other Nigerian settings, direct patient-level comparisons of serological and stool antigen testing at Federal Medical Centre, Asaba, remain insufficiently characterised. This study therefore addresses the need for local evidence on the relative diagnostic performance and agreement of these two non-invasive methods in the same patient population.

1.1 Aim

This study aims to compare the diagnostic performance of serological testing against faecal antigen testing.

1.2 Specific Objectives

- Determine the prevalence of *Helicobacter pylori* infection among patients attending Federal Medical Centre, Asaba, using serological and stool antigen testing methods.
- Determine the sensitivity, specificity, positive predictive value, and negative predictive value of the serological method for detecting *H. pylori*, using the stool antigen method as the reference standard.
- Determine the level of agreement between serological and stool antigen testing methods for the detection of *H. pylori* infection.

2. Materials and Methods

2.1 Study Area

The study site was the Molecular Laboratory Unit, Centre for Disease Control and Research, Federal Medical Centre, Asaba, Delta State, Nigeria.

2.2 Study Design

This was a prospective cross-sectional study comparing two diagnostic testing methods for the detection of *H. pylori* infection among patients at Federal Medical Centre, Asaba, Delta State.

2.3 Study Population

The study population comprised all individuals tested for *H. pylori* infection over a one-year period, from 26 June 2023 to 25 May 2024.

2.4 Sample size

The sample size was calculated using the population proportion formula described by Charan and Biswas (2013).

$$N=Z^2PQ/d^2$$

Where N = sample size

Z= Confidence interval set at 1.96
P= Expected prevalence using a prevalence rate of 88% in Nigeria (Hooi *et al.*, 2017)
Q= 1-Prevalence i.e. (1 – 0.88)
d= Desired level of significance usually set at 0.05
therefore,
$N= 1.96^2 \text{ X } 0.88 \text{ X } 0.12/0.05^2$
N= 3.842 X 0.88 X 0.12/0.0025
N=0.4057/0.0025
N= 162

To account for possible non-compliance and minimise the effect of non-response, an additional 10% of the sample size was added. i.e., 162 x 10/100= 16.2

The final N was therefore 162 + 16.2 = 178.2, rounded up to 179.

N= 179

3. Methodology

A total of three hundred and ninety-seven (397) patients aged 4-83 years who were evaluated for *Helicobacter pylori* infection participated in this prospective cross-sectional study. Both male and female subjects were tested using serological and stool antigen methods. Eligible patients who presented for routine serological testing and consented to participate were provided with sterile stool containers for fresh stool sample collection. Stool samples were collected from the patients using clean, sterile, wide-mouthed containers and analysed using the Swe-Care *H. pylori* stool antigen rapid diagnostic test kit. In brief, a small portion of the stool sample was collected using the applicator provided in the kit and transferred into a sample extraction buffer (Smith *et al.*, 2022). The mixture was shaken vigorously to ensure proper homogenisation. Two to three drops of the extracted specimen were dispensed into the sample well of the test cassette. The test was allowed to run at room temperature for approximately 15 minutes (Luz *et al.*, 2025). The appearance of two coloured lines (control and test lines) indicated a positive result for *H. pylori* antigen, whereas the appearance of only the control line indicated a negative result. The presence of the control line validated the test procedure (Kubo *et al.*, 2024). For serological analysis, blood samples were collected from the same patients using a standard venipuncture technique into plain vacutainer tubes and allowed to clot. The samples were centrifuged at 3000g for 5 mins to obtain serum, which was used for the detection of *H. pylori* antibodies using the Swe-Care rapid diagnostic test kit. In brief, two (2) drops of serum were added to the sample well of the test device, followed by the addition of buffer solution as specified by the manufacturer (Imperial *et al.*, 2024). The test device was left undisturbed at room temperature for 15 minutes. The appearance of both control and test lines indicated a positive result (presence of *H. pylori* antibodies), whereas only the control line indicated a negative result. The absence of the control line rendered the test invalid (Khorsheed, 2024).

3.1 Informed Consent

Eligible patients were informed about the purpose, procedures, benefits, and voluntary nature of the study. Written informed consent was obtained from all participants before stool sample collection. Participants were assured that refusal to participate would not affect their routine clinical care. All information obtained during the study was treated confidentially by anonymizing all data and ensuring that no personal identifiers were included in the analysis.

3.2 Inclusion Criteria

- Patients attending Federal Medical Centre, Asaba, whose diagnosis involved routine serological testing for *Helicobacter pylori*.
- Patients who voluntarily agreed to be part of this study.
- Patients who provided a fresh stool sample for the study.
- Patients for whom both serology and stool antigen test results were available.

3.3 Exclusion Criteria

- Patients who were on treatment for *H. pylori*.

3.4 Statistical Analysis

R software was used for data analysis. Agreement between the two diagnostic methods was evaluated using Cohen's kappa coefficient with 95% confidence intervals.

Ethical Consideration: Ethical approval for the study was obtained from the Ethics and research committee of the Federal Medical Centre, Asaba. The reference number on the approval letter is FMC/ASB/A81 VOL. XII/283.

4. Results

In Table 1a, serology identifies 43.07% as positive and 56.93% as negative, whereas in Table 1b, stool identifies 42.57% as positive and 57.43% as negative. This indicates that the two methods show similar positivity rates, demonstrating that a comparable proportion of the patients have *H. pylori* infection. This is further illustrated in Figure 1, which visually reinforces the similarity between the two testing methods. However, the clinical interpretation of the two test results should be undertaken with caution because of the biological markers being detected. Serology detects antibodies against *H. pylori*, which cannot distinguish between current and past exposure, whereas stool testing detects antigen indicative of active infection.

Table 1a. Serology Test Results

Result	Percentage	Proportion
Positive	43.07%	0.4307
Negative	56.93%	0.5693

Table 1b. Stool Antigen Test Result

Result	Percentage	Proportion
Positive	42.57%	0.4257
Negative	57.43%	0.5743

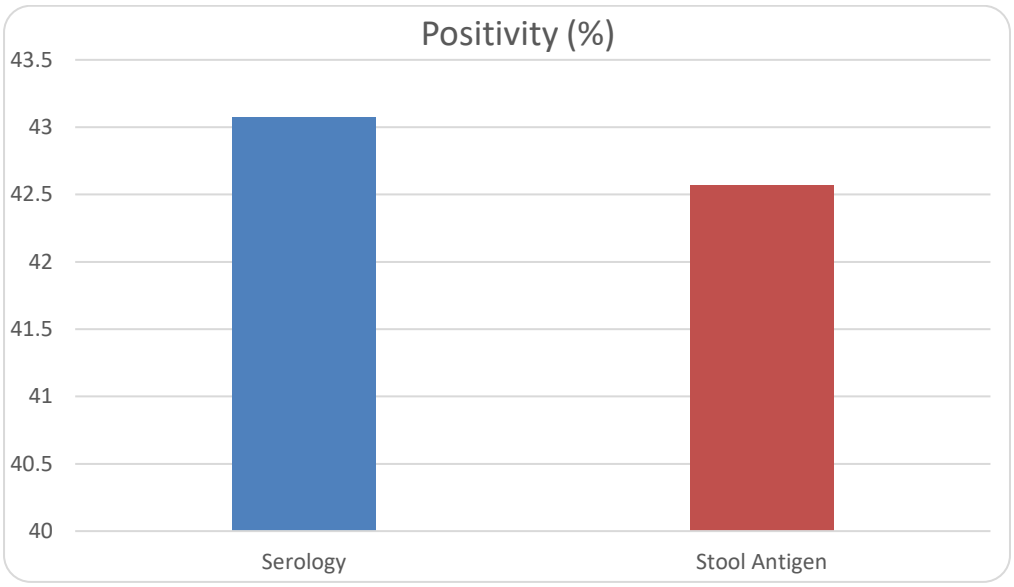


Fig. 1. Comparison of positivity rates between serology and stool antigen tests

Tables 1a and 1b show the positivity rates obtained from serology and stool antigen testing.

As shown in Table 2, there is a significantly high burden of infection in the population studied, at approximately 43%.

Table 2. Showing the Prevalence of *H. Pylori* Infection

RESULTS

PREVALENCE OF *H. PYLORI* INFECTION

Stool antigen test was used as the reference standard for determining the prevalence of *H. pylori* infection.

Prevalence based on stool antigen (reference standard)

Stool antigen result	Number	Percentage (%)
Positive	169 (TP + FN)	**42.57**
Negative	228 (TN + FP)	**57.43**
Total	**397**	**100.00**

$$\text{Prevalence} = \frac{\text{Number positive (stool antigen)}}{\text{Total tested}} \times 100$$

$$= \frac{169}{397} \times 100$$

$$= 42.57\%$$

Therefore, the prevalence of *H. pylori* infection in the study population based on stool antigen test (reference standard) was **42.57% (169/397).**

In Table 3, 158 patients who are positive by stool antigen testing were correctly identified by serology as positive (TP), while 11 patients are positive by stool and negative by serology (FN). Of the patients who are negative by stool, 215 were correctly identified by serology as negative (TN), while 13 patients are positive by serology despite being positive by stool (FP). This demonstrates that serology correctly identifies the majority of patients, with false-positive and false-negative results.

Table 3. Cross tabulation of serology when compared with stool antigen testing.

Serology	**StoolAg**		
	Positive	**Negative**	**Total**
Positive	158 (TP)	13 (FP)	171
Negative	11(FN)	215 (TN)	226
Grand Total	169	228	397

TP (True Positive), TN (True Negatives),
FP (False Positives), FN (False Negatives)

Fig. 2 shows the diagnostic performance of serology using stool as a reference test. The sensitivity was 93.5%, showing that among those patients who are positive by the stool testing method, serology correctly identified 93.5% as positive. The specificity was 94.3%, showing that among patients who are negative by the stool testing method, serology was able to identify 94.3%.

4.1 Diagnostic Performance

As shown in Figure 3, the positive predictive value (PPV) was 92.4%, indicating that 92.4% of the patients were truly positive, while 7.6% were false positives. The negative predictive value (NPV) was 95.1%, indicating that 95.1% of the patients were truly negative, while 4.9% were false negatives. This shows good diagnostic accuracy.

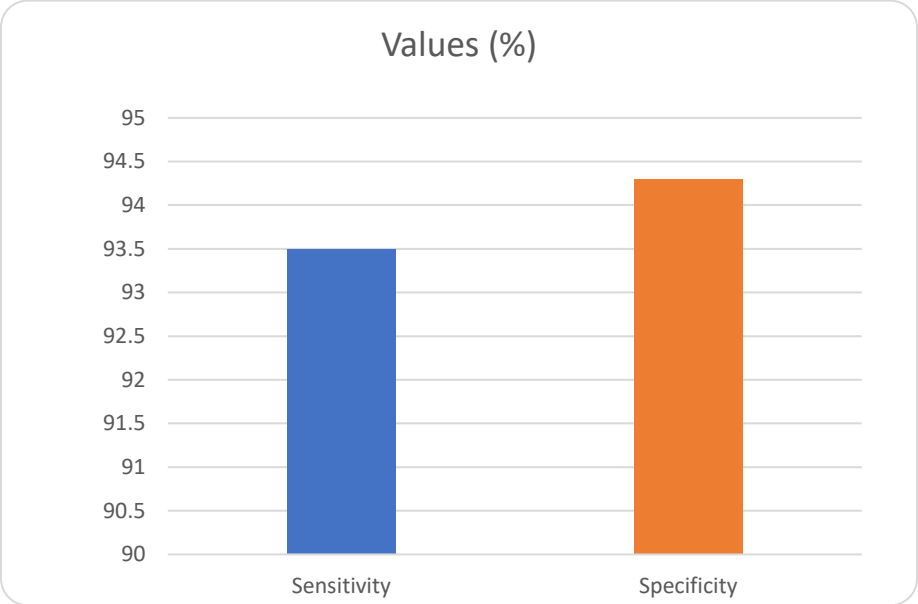


Fig. 2. Diagnostic performance showing sensitivity and specificity

4.2 Predictive Values

As shown in Table 4, diagnostic performance alone cannot demonstrate the clinical usefulness of the test methods, so Cohen's kappa was performed to show whether the two methods classify the patients similarly. Cohen's kappa showed k = 0.877 indicating almost perfect agreement. This indicates that the agreement between the serology and stool antigen methods is strong beyond what is expected by chance. This shows that the two methods did classify patients similarly where serology is negative but cannot be used interchangeably because of the different biological markers detected. Serology cannot distinquish between antibody detection and evidence of active infection.

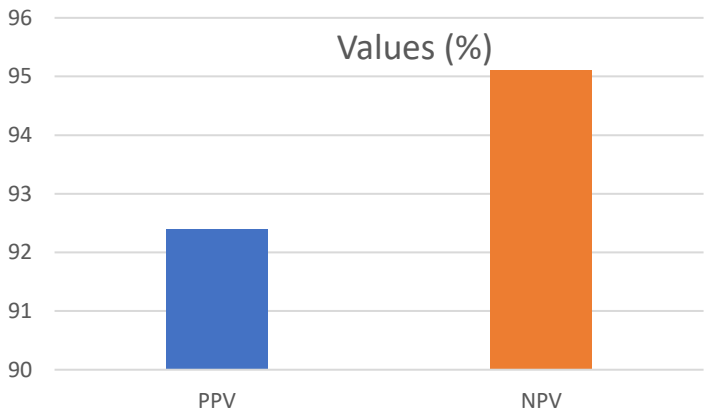


Fig. 3. PPV (92.4%) NPV (95.1%)

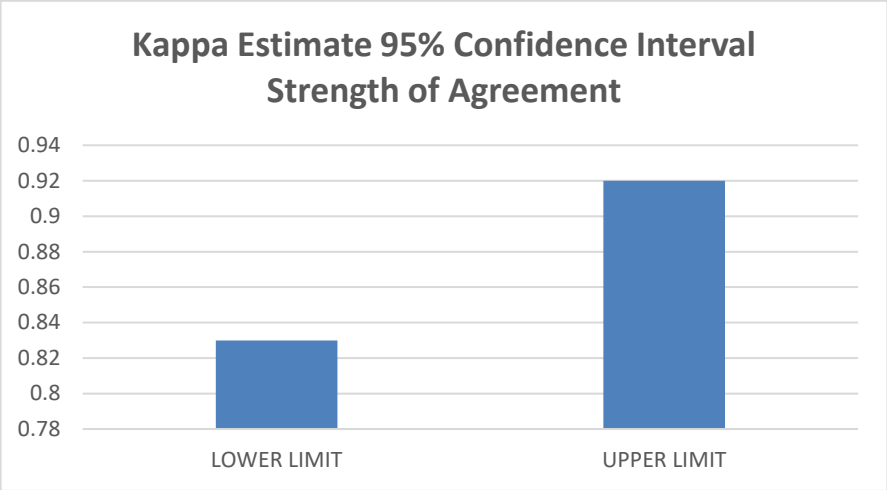


Fig. 4. Showing Kappa Estimate 95% Confidence interval Strength of Agreement

5. Discussion

The study evaluated the diagnostic performance of serology and stool antigen tests in detecting infection within the study population. The overall positivity rate for serology was 43.07%, while stool antigen testing showed a positivity rate of 42.57%, indicating a relatively high prevalence of infection in the population studied. Although the rates are similar, the difference in detection mechanisms should be considered. The marginally higher positivity rate with serology than with stool antigen testing reflects its detection of circulating antibodies produced by the host in response to infection, which can persist after infection clearance and may lead to higher detection of active infection. However, stool antigen testing identifies active infection by detecting the presence of pathogen-specific antigens in faecal samples, making it more specific for ongoing infection and less likely to remain positive after successful clearance of the organism. In that case, the slightly lower positivity rate observed with stool testing indicates the ability of the test to distinguish active infection from past exposure, which is clinically relevant for monitoring treatment outcomes.

The age distribution was similar across both males and females, showing that there was no significant age imbalance between the two groups. The mean age of this study population was approximately 38 years, indicating that most participants were young to middle-aged adults who are often economically active. This finding demonstrates that the study population was evenly distributed in terms of age, which helps to reduce bias related to age differences.

The diagnostic performance revealed a high sensitivity of 93.5% and specificity of 94.3%, demonstrating the ability of the test to correctly identify both infected and non-infected individuals and showing excellent diagnostic performance. This study can be compared with previously published data. The sensitivity reported exceeds that reported by Charach *et al.* (2024) for a monoclonal stool antigen assay (70%) using a composite reference standard of histology, rapid urease testing, and urea breath testing. The finding is also comparable with the 91% sensitivity reported by Arikan *et al.* (2004) using a stool antigen test in a high-prevalence Turkish cohort and the 95.2% sensitivity reported by Chen *et al.* (2025) for serology in Taiwanese adults aged ≤45 years without gastric atrophy. The high sensitivity observed in this study is comparable to findings reported by Chey *et al.* (2017), who observed that serological assays generally possess good sensitivity but are limited by their inability to distinguish active infection from previous exposure. Malfertheiner *et al.* (2022) and Smith *et al.* (2024) also emphasised that, while serological testing remains useful for epidemiological surveys and preliminary screening, it is less reliable than stool antigen testing for confirming active *H. pylori* infection.

The specificity of 94.3% demonstrated in this study is higher than the 59.65% specificity reported by Alfau *et al.* (2023) in a Dominican Republic population using stool antigen testing, but is closely related to the 94.4% specificity reported by Charach *et al.* (2024) using a monoclonal chemiluminescent immunoassay. Similar limitations of serology have been reported, and positive results need confirmation by stool antigen or urea breath testing to establish active infection (Khan *et al.*, 2024; Ali *et al.*, 2025). The high diagnostic performance demonstrated in this study is further supported by the findings of Opekun *et al.* (2020), who reported that the stool antigen test demonstrated a sensitivity of 95.5% and specificity of 97.6% when evaluated against a composite reference standard comprising histology, rapid urease testing, and culture. The diagnostic indices reported by Opekun *et al.* further support the reliability of stool antigen testing as a non-invasive method for detecting active *H. pylori* infection.

Furthermore, the high PPV (92.4%) and NPV (95.1%) highlight the clinical usefulness of the test in our setting, showing strong confidence in both positive and negative results. It is important to note that these predictive values may be influenced by the relatively high prevalence observed in the study population. These findings are consistent with studies reporting high diagnostic accuracy for stool antigen testing (Gisbert, 2025; Shimoyama, 2013). The high NPV of 95.1% demonstrated that patients who tested negative by serology were truly negative according to the stool antigen reference method. Therefore, a negative serology result supports the use of this test for rule-out purposes in low-risk populations.

While sensitivity and specificity were high, Cohen's kappa showed agreement of 0.877(95% CI:0.83-0.92) between the two methods. According to Cohen's kappa statistics, kappa values measure agreement beyond chance; therefore, the high kappa coefficient ssvalue despite high sensitivity and specificity suggest that the two methods are not entirely interchangeable and may yield discordant results in certain cases. The observed variation in agreement is likely due to the fundamental differences in the biological markers detected by each test—antibodies versus antigens. This discordant result is expected because serology detects IgG antibodies, which can persist for months after eradication, while stool antigen testing detects current infection by identifying *H. pylori* bacterial antigens found in the faeces (Malfertheiner *et al.*, 2022). According to Chey *et al.* (2017), the discordant results (13 false positives and 11 false negatives) demonstrate the biological differences between the two testing methods. False-positive serological results may occur because antibodies persist after previous infection, while false-negative results may arise during the early stages of infection before antibody levels become detectable or among immunocompromised individuals with reduced antibody production. The high prevalence observed in this study may be associated with environmental and socioeconomic factors such as poor sanitation, inadequate hygiene practices, and exposure to contaminated sources, which are common vehicles of infection in similar settings (Aziz *et al.*, 2015).

6. Limitations of the Study

- Stool antigen testing was used as the reference standard instead of invasive methods such as histology, rapid urease testing, or bacterial culture, which are regarded as definitive diagnostic methods.
- Although the findings provide valuable evidence from a tertiary healthcare setting in South-South Nigeria, multicentre studies involving more diverse populations are required to determine whether similar results would be observed in other regions of Nigeria.
- Since the study had a cross-sectional design, participants were assessed only once; therefore, treatment response and long-term changes in infection status could not be evaluated.
- Information on recent antibiotic use, proton pump inhibitor therapy, and previous *H. pylori* eradication treatment, which may influence stool antigen test performance, was limited.
- Serological assays detect antibodies that may persist for months or years after eradication; therefore, some positive serological results may represent previous rather than active infection.

Added Value to Existing Knowledge: By evaluating diagnostic accuracy alongside Cohen's kappa agreement, this study provides comprehensive local evidence on the comparative performance of serological and stool antigen testing for *Helicobacter pylori*, thereby strengthening the evidence base for selecting appropriate non-invasive diagnostic methods in clinical practice. The results also provide evidence that can guide clinicians and policymakers in choosing cost-effective, non-invasive diagnostic strategies for *H. pylori* infection in resource-limited healthcare settings. Furthermore, this study adds valuable data from Delta State, Nigeria, where published comparative diagnostic studies remain relatively limited.

7. Conclusion

Among the 397 patients evaluated, serology and stool antigen testing produced positivity rates of 43.07% and 42.57%, respectively. Relative to stool antigen testing, serology showed a sensitivity of 93.5%, specificity of 94.3%, positive predictive value of 92.4%, and negative predictive value of 95.1%. The paired results therefore indicate high agreement, although 24 discordant results were observed. These findings demonstrate that serological testing may provide useful information in settings where rapid non-invasive screening is required. However, its inability to distinguish previous exposure from active infection limits its use for confirming current infection. Stool antigen testing is consequently more appropriate when evidence of active *H. pylori* infection is required. Interpretation should consider the study's single-centre design and the use of stool antigen testing as the reference comparator.

Consent

Eligible patients were informed about the purpose, procedures, benefits, and voluntary nature of the study. Written informed consent was obtained from all participants before stool sample collection. Participants were assured that refusal to participate would not affect their routine clinical care. All information obtained during the study was treated confidentially by anonymizing all data and ensuring that no personal identifiers were included in the analysis.

Ethical Approval

Ethical approval for the study was obtained from the Ethics and research committee of the Federal Medical Centre, Asaba. The reference number on the approval letter is FMC/ASB/A81 VOL. XII/283.

Declaration of AI Use

This manuscript was prepared through the intellectual contributions of the author(s) to the study design, data analysis, interpretation of results, and scholarly content. Grammarly and ChatGPT were used solely to assist with grammatical refinement and reference formatting during manuscript revision. The author(s) accept full responsibility for the accuracy, integrity, and final content of the manuscript.

Competing Interests

Authors have declared that no competing interests exist.

References

Abere, S., Sixtus, O., & Koko-James, N. (2025). Establishing a consensus algorithm for *H. pylori* screening, diagnosis, initial management, and referral protocols for primary care physicians. *Nigerian Medical Journal: Journal of the Nigeria Medical Association, 66*(4), 1374-1385. https://doi.org/10.71480/nmj.v66i4.789

Alfau, M., Delgado, A., Reyes, C., Durán, D., Arbaje, D., & García, A. (2023). Accuracy of stool antigen test in the diagnosis of *Helicobacter pylori* infection in the Dominican Republic. *Cureus, 15*(8), e44290. https://doi.org/10.7759/cureus.44290

Ali, H., Ullah, M., Jamshaid, S., Hamza, Khan, H., Shehzad, B., & Ullah, I. (2025). Comparison of *Helicobacter pylori* antibody and antigen tests for diagnosing infection in symptomatic patients: A cross-sectional study from District Mardan. *Journal of Health, Wellness and Community Research, 3*(3), e118. https://doi.org/10.61919/67thsb08

Arikan, S., Kocakusak, A., Barut, G., Sengoz, G., Yucel, A. F., & Gokturk, K. (2004). *Helicobacter pylori* stool antigen test: Results of a prospective study. *Surgery Today, 34*(4), 318-322. https://doi.org/10.1007/s00595-003-2718-9

Aziz, R. K., Khalifa, M. M., & Sharaf, R. R. (2015). Contaminated water as a source of *Helicobacter pylori* infection: A review. *Journal of Advanced Research, 6*(4), 539-547. https://doi.org/10.1016/j.jare.2013.07.007

Bosch, D. E., Krumm, N., Wener, M. H., Yeh, M. M., Truong, C. D., Reddi, D. M., Liu, Y., Swanson, P. E., Schmidt, R. A., & Bryan, A. (2020). Serology is more sensitive than urea breath test or stool antigen for the initial diagnosis of *Helicobacter pylori* gastritis when compared with histopathology. *American Journal of Clinical Pathology, 154*(2), 255-265. https://doi.org/10.1093/ajcp/aqaa043

Charach, L., Perets, T. T., Gingold-Belfer, R., Huta, Y., Ashorov, O., Levi, Z., Dickman, R., & Boltin, D. (2024). Comparison of four tests for the diagnosis of *Helicobacter pylori* infection. *Healthcare, 12*(15), 1479. https://doi.org/10.3390/healthcare12151479

Charan, J., & Biswas, T. (2013). How to calculate sample size for different study designs in medical research? *Indian Journal of Psychological Medicine, 35*(2), 121-126. https://doi.org/10.4103/0253-7176.116232

Chen, M.-J., Fang, Y.-J., Chen, C.-C., Chen, C.-C., Luo, J.-C., Bair, M.-J., Chen, P.-Y., Chou, C.-K., Lee, J.-Y., Yang, T.-H., Yu, J.-J., Kuo, C.-C., Chiu, M.-C., Chen, C.-Y., Shun, C.-T., Hu, W.-H., Tsai, M.-H., Hsu, Y.-C., Tseng, C.-H., ... Liou, J.-M. (2025). Overall and stratified accuracies of *H. pylori* serology testing: A multicenter study of 8497 screening-naïve adults. *Helicobacter, 30*(5), e70074. https://doi.org/10.1111/hel.70074

Chey, W. D., Leontiadis, G. I., Howden, C. W., & Moss, S. F. (2017). ACG clinical guideline: Treatment of *Helicobacter pylori* infection. *American Journal of Gastroenterology, 112*(2), 212-239. https://doi.org/10.1038/ajg.2016.563

Chukwudike, E. S., Asombang, A. W., Sawyer, K., Tazinkeng, N. N., Oyeleke, G. K., Egboh, S.-M. C., Nowbuth, A. A., Bitto, T. T., Moyo, C. M., & Moss, S. (2021). S1409 *Helicobacter pylori* (*H. pylori*) eradication rates and antibiotic resistance pattern in Nigeria, West Africa: A systematic review. *The American Journal of Gastroenterology, 116*(1), S647-S647. https://doi.org/10.14309/01.ajg.0000779168.85569.69

Costa, L. C. M. C., das Graças Carvalho, M., La Guárdia Custódio Pereira, A. C., Teixeira Neto, R. G., Andrade Figueiredo, L. C., & Barros-Pinheiro, M. (2024). Diagnostic methods for *Helicobacter pylori*. *Medical Principles and Practice, 33*(3), 173-184. https://doi.org/10.1159/000538349

Gisbert, J. P. (2025). *Helicobacter pylori* and gastric disease. *Medicina Clínica (English Edition), 165*(1), 106974. https://doi.org/10.1016/j.medcli.2025.106974

Hooi, J. K. Y., Lai, W. Y., Ng, W. K., Suen, M. M. Y., Underwood, F. E., Tanyingoh, D., Malfertheiner, P., Graham, D. Y., Wong, V. W. S., Wu, J. C. Y., Chan, F. K. L., Sung, J. J. Y., Kaplan, G. G., & Ng, S. C. (2017). Global prevalence of *Helicobacter pylori* infection: Systematic review and meta-analysis. *Gastroenterology, 153*(2), 420-429. https://doi.org/10.1053/j.gastro.2017.04.022

Ichita, C., Ishibashi, F., Hagiwara, Y., Takasu, A., Kemmoto, Y., Li, R., Kusano, C., Wei, T., Matsuyama, Y., Yamamichi, N., Inoue, M., Ishikawa, H., & Gotoda, T. (2026). Diagnostic accuracy of serum antibody, urine antibody, and stool antigen tests for *Helicobacter pylori* in Japan: A systematic review and meta-analysis. *Helicobacter, 31*(4), e70157. https://doi.org/10.1111/hel.70157

Imperial, M., Tan, K., Fjell, C., Chang, Y., Krajden, M., Kelly, M. T., & Morshed, M. (2024). Diagnosis of *Helicobacter pylori* infection: Serology vs. urea breath test. *Microbiology Spectrum, 12*(11), e0108424. https://doi.org/10.1128/spectrum.01084-24

Jemilohun, A. C., Ajani, M. A., Solaja, T. O., & Ngubor, T. D. (2020). *Helicobacter pylori* and precancerous lesions of the stomach in a Southwestern Nigerian population. *West African Journal of Medicine, 37*(4), 377-384. https://pubmed.ncbi.nlm.nih.gov/32835399/

Khan, M. A., Mughal, I. A., Ahmed, R. I., Kiyani, J. A., Hanif, M., & Kousar, T. (2024). Assessment of *Helicobacter pylori* antibodies and stool antigens in pediatric patients with epigastric pain: Diagnostic insights and clinical implications. *Journal of Islamabad Medical & Dental College, 13*(2), 355-360. https://doi.org/10.35787/jimdc.v13i2.1264

Khorsheed, S. A. (2024). A comparative study of serological and stool antigen tests for *Helicobacter pylori* infection diagnosis. *Journal of Angiotherapy, 8*(4), 1-6. https://doi.org/10.25163/angiotherapy.849578

Kubo, K., Mabe, K., Kikuchi, S., & Kato, M. (2024). Diagnostic accuracy of a novel stool antigen test for *Helicobacter pylori* infection in a medical checkup setting: A prospective cohort study. *Internal Medicine, 63*(11), 1525-1529. https://doi.org/10.2169/internalmedicine.2412-23

Li, Y., Choi, H., Leung, K., Jiang, F., Graham, D. Y., & Leung, W. K. (2023). Global prevalence of *Helicobacter pylori* infection between 1980 and 2022: A systematic review and meta-analysis. *The Lancet Gastroenterology & Hepatology, 8*(6), 553-564. https://doi.org/10.1016/S2468-1253(23)00070-5

Luz, M. S., de Castro, C. T., Lemos, F. F. B., Rocha, G. R., Santos, G. L. C., Pinheiro, S. L. R., de Oliveira Silva, L. G., Calmon, M. S., Oliveira, M. V., Teixeira, K. N., de Magalhães Queiroz, D. M., & de Melo, F. F. (2025). Stool antigen test for *Helicobacter pylori* infection in adults: A meta-analysis of diagnostic test accuracy. *Journal of Clinical Gastroenterology, 59*(5), 393-404. https://doi.org/10.1097/MCG.0000000000002102

Malfertheiner, P., Megraud, F., Rokkas, T., Gisbert, J. P., Liou, J. M., Schulz, C., Gasbarrini, A., Hunt, R. H., Leja, M., O'Morain, C., Rugge, M., Suerbaum, S., Tilg, H., Sugano, K., & El-Omar, E. M. (2022). Management of *Helicobacter pylori* infection: The Maastricht VI/Florence consensus report. *Gut, 71*(9), 1724-1762. https://doi.org/10.1136/gutjnl-2022-327745

Malhotra, S., Agarwal, A., Tak, V., Abhishek, K. S., Kombade, S. P., Gadepalli, R., Birda, C. L., Solanki, V., & Elhence, P. (2025). Comparison of different diagnostic modalities for *Helicobacter pylori* infection in patients with functional dyspepsia and peptic ulcer disease. *Infectious Disorders - Drug Targets, 25*(8), e18715265353431. https://doi.org/10.2174/0118715265353431250604133427

Mashiko, S., Ifeanyi Smith, S., Rose, U., Abiodun, O. J., Jaka, H., Charles, O., Abdulrashid, N., Violet, K., Evariste, T.-K., Dennis, N., Revathi, G., Naima, L.-A., Abraham, A., Jolaiya, T. F., Yakhya, D., Mohamed, A., & Roland, N. (2024). *Helicobacter pylori* management in Africa: A survey of diagnostic, treatment, and related resources. *Helicobacter, 29*(6), e13153. https://doi.org/10.1111/hel.13153

Meshack, B. B., Nwokah, E., & Amala, E. S. (2024). A comparative study of the rate of *Helicobacter pylori* infection using three diagnostic techniques among patients in Rivers State. *International Journal of Pathogen Research, 13*(6), 68-77. https://doi.org/10.9734/ijpr/2024/v13i6322

Nwankwo, I. U., Edward, K. C., Nwoba, C. N., & Ezeanwe, G. O. (2021). Prevalence of *Helicobacter pylori* among suspected stomach ulcer patients attending two mission hospitals in Umuahia, Abia State, Nigeria. *Nigerian Journal of Microbiology, 35*(2), 5927-5935. https://doi.org/10.67614/njm.2021.lu5uvpfh

Omosor, K. I., Omosor, O. H., Ibeh, I. N., Adejumo, B. I. G., Abdulkadir, U. I., Dimkpa, U., Uchuno, G. A., Oke, O. M., Abdulkadir, R. L., Hamidu, M. V., & Emmanuel, A. M. (2017). Seroprevalence of *Helicobacter pylori* infection and risk factors among asymptomatic subjects in Delta State, Nigeria. *Advances in Microbiology, 7*(9), 641-652. https://doi.org/10.4236/aim.2017.79050

Opekun, A. R., Zierold, C., Rode, A., Blocki, F. A., Fiorini, G., Saracino, I. M., Vaira, D., & Sutton, F. M. (2020). Clinical performance of the automated LIAISON R Meridian *H. pylori* SA stool antigen test. *BioMed Research International, 2020*, 7189519. https://doi.org/10.1155/2020/7189519

Shimoyama, T. (2013). Stool antigen tests for the management of *Helicobacter pylori* infection. *World Journal of Gastroenterology, 19*(45), 8188-8191. https://doi.org/10.3748/wjg.v19.i45.8188

Smith, S. I., Ajayi, A., Jolaiya, T. F., & Essiet, U. (2022). Prevalence, diagnosis and treatment of *Helicobacter pylori* infection in Nigeria. *Nigerian Journal of Gastroenterology and Hepatology, 14*(1), 2-10. https://doi.org/10.4103/njgh.njgh_10_22

Smith, S. I., Schulz, C., Ugiagbe, R., Ndip, R., Dieye, Y., Leja, M., Onyekwere, C., Ndububa, D., Ajayi, A., Jolaiya, T. F., Jaka, H., Setshedi, M., Gunturu, R., Otegbayo, J. A., Lahbabi-Amrani, N., Arigbabu, A. O., Kayamba, V., & Nashidengo, P. A. (2024). *Helicobacter pylori* diagnosis and treatment in Africa: The first Lagos Consensus statement of the African Helicobacter and Microbiota Study Group. *Digestive Diseases, 42*(3), 240-256. https://doi.org/10.1159/000537878

Sun, M., Liu, E., Yang, L., Cao, H., & Han, M. (2025). A scoping review of worldwide guidelines for diagnosis and treatment of *Helicobacter pylori* infection. *Systematic Reviews, 14*(1), 107. https://doi.org/10.1186/s13643-025-02816-0

Tang, T., Paz, E. A., Yu, K., Lee, K. H., Tay, C. Y., Wang, J., Marshall, B. J., Hu, L., Fu, W., & Yang, Z. (2026). Current *Helicobacter pylori* diagnostics: Established methods, resistance testing, and emerging approaches. *JGH Open, 10*(9), e70461. https://doi.org/10.1002/jgh3.70461

Tiwari, R., Tiwari, G., Gupta, A., & Ramachandran, V. (2025). The role of non-*Helicobacter pylori* bacteria in the pathogenesis of gastric diseases. *Chinese Journal of Applied Physiology, 41*, e20250027. https://doi.org/10.62958/j.cjap.2025.027

Umar, A., Owolagba, G. K., Aliyu, S. M., Hassan, M. D., Abubakar, U., Mohammed, M. O., & Sani, M. S. (2023). Comparative study of some staining methods for the demonstration of *Helicobacter pylori* in gastric biopsies in Gombe State, Nigeria. *Journal of International Research in Medical and Pharmaceutical Sciences, 18*(3), 26-34. https://doi.org/10.56557/jirmeps/2023/v18i38598

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