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Prevalence and Risk Factors of *Helicobacter Pylori* Infection among University Students in Maiduguri, Borno State, Nigeria

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ABSTRACT
Helicobacter Pylori is associated with several upper gastrointestinal disorders and remains an important public health concern. Information on serological evidence of exposure among university students in Maiduguri is limited. This study assessed the seroprevalence of *H. pylori* antibodies and examined selected demographic and behavioural characteristics among university students in Maiduguri, Borno State, Nigeria. A cross-sectional study was conducted between June and August 2019 among 50 students comprising 28 males and 22 females. Blood samples were collected and screened for *H. pylori* antibodies using a rapid serological test. Participant characteristics, including age, sex, accommodation, blood group, dietary practices and handwashing frequency, were examined. Nineteen participants tested positive, giving an overall seroprevalence of 38.0%. Seropositivity was observed in 9 of 28 males (32.1%) and 10 of 22 females (45.5%). The corresponding proportions were 7 of 22 (31.8%) among students living on campus and 12 of 28 (42.9%) among those living off campus. Differences were also observed across other participant characteristics, although the reported statistical analyses require verification. The findings indicate serological evidence of previous or current *H. pylori* exposure among the sampled students. Because antibody testing cannot reliably distinguish active infection from previous exposure, further studies using validated tests for active infection and larger representative samples are recommended.

Keywords: *Helicobacter Pylori*, Seroprevalence, University Students, Associated Factors, Maiduguri, Nigeria

INTRODUCTION

Helicobacter pylori (*H. pylori*) previously named *Campylobacter pylori*, is a spiral, flagellated Gram negative, microaerophilic bacterium found in the stomach with a capability for abundant urease production which has been implicated in several upper gastrointestinal diseases that present dyspepsia (Christopher *et al.,* 2010). It was the first formally recognized bacterial carcinogen and one of the most successful human pathogens, which has been etiologically associated with gastritis and gastritis associated diseases, peptic ulcer, gastric adenocarcinoma and primary gastric lymphoma (Mynepalli*et al.*, 2014). Previous research has shown that *Helicobacter pylori* are present in patients with chronic gastritis, duodenal ulcers, conditions not previously believed to have a microbial cause (Jemikalajah and Okogun, 2014).

H. pylori infection has been identified as an important risk factor for the development of peptic ulcer disease (PUD) and is probably the most important cause of relapse in those previously treated for peptic ulcer disease (Tijjani and Umar, 2008). *H. pylori* infection may lead to acute gastritis (abdominal pain, nausea and vomiting) within two weeks following infection. Many patients infected with the organism have recurrent abdominal symptoms (non-ulcer dyspepsia) without ulcer disease. Duodenal inflammation (duodenitis) also often occurs, as well as peptic ulcer. These are sores that develop in the lining of the stomach, lower oesophagus, or duodenum; gastric ulcers, oesophageal ulcers and duodenal ulcers respectively (Higuera, 2005). Common risk factors for peptic ulcer disease include: *Helicobacter Pylori* infection and non-steroidal anti-inflammatory drugs (NSAIDs). The less common risk factors include alcohol, smoking, cocaine, severe illness, autoimmune problems, radiation therapy and Cohn's disease among others (Mustafa *et al*., 2015). Furthermore, peptic ulcer disease is one of the most common human ailments, affecting approximately 50% of the world population (Mustafa *et al.,* 2015).

The most common symptom of peptic ulcer is burning abdominal pain that extends from the navel to the chest, which can range from mild to severe. Other symptoms include; changes in appetite, nausea, blood or dark stool (melena), indigestion, vomiting and weight loss (Higuera, 2005). Complications of peptic ulcer disease include bleeding, perforation, gastric outlet obstruction and gastric cancer. Older persons are at higher risk of peptic ulcer disease because of high- risk medication use, including anti-platelet drugs, warfarin, selective serotonin, proton pump inhibitors and bisphosphonates (Fashner and Gitu, 2015).

Helicobacter pylori (H. pylori) colonises the human stomach and is recognised as one of the most common bacterial infections worldwide. It produces urease, an enzyme that enables it to survive in the acidic environment of the stomach. The organism is associated with chronic gastritis, peptic ulcer disease, gastric adenocarcinoma and gastric mucosa-

associated lymphoid tissue lymphoma. The prevalence of H. pylori varies considerably across geographical regions and population groups, with higher rates generally reported in developing countries than in developed countries This variation has been linked to socioeconomic status, overcrowding, poor environmental sanitation, unsafe drinking water and limited access to healthcare. Infection is commonly acquired during childhood and may persist into adulthood if untreated. A global systematic review reported a pooled prevalence of approximately 44.3%, demonstrating the substantial public health burden of the organism. Transmission is believed to occur mainly through oral–oral and faecal–oral routes, particularly through close household contact, contaminated food or water, and inadequate hygiene practices. Parent-to-child and horizontal transmission have also been reported (Mahmood*et al*., 2026).

Several diagnostic methods are available for detecting H. pylori, including gastric biopsy, histological examination, rapid urease testing, bacterial culture, urea breath testing, stool antigen testing and serological antibody detection. While the urea breath test and stool antigen test are useful for identifying active infection, serological tests detect antibodies indicating previous or current exposure and cannot reliably distinguish between the two. In Nigeria, studies have reported varying levels of H. pylori prevalence among different population groups, including children and hospital patients, with differences partly attributable to the populations investigated and diagnostic methods employed. Previous investigations in northern Nigeria and Maiduguri have demonstrated the presence of H. pylori, particularly among children and patients presenting with gastrointestinal complaints. However, findings from hospital-based populations may not adequately represent university students, whose accommodation, social interactions, dietary practices and hygiene behaviours may influence their exposure to the organism. Despite previous studies in the region, information on the seroprevalence of H. pylori antibodies and associated demographic and behavioural characteristics among university students in Maiduguri remains limited. Therefore, this study was designed to determine the seroprevalence of H. pylori antibodies among university students in Maiduguri, Borno State, Nigeria, and examine their distribution in relation to selected factors, including age, sex, accommodation, blood group, family history, dietary practices and handwashing habits (Tang et al., 2026).

Helicobacter pylori (H. pylori) is recognised as one of the most prevalent bacterial pathogens worldwide. Its ability to survive in the acidic gastric environment is largely attributed to the production of urease, an enzyme that neutralises gastric acid around the organism. Persistent colonisation may cause chronic gastritis and is associated with peptic ulcer disease, gastric adenocarcinoma and gastric mucosa-associated lymphoid tissue lymphoma (Lamrabet*et al*., 2026). The epidemiology of H. pylori varies across geographical regions and population groups, with generally higher prevalence reported in developing countries. This variation has been associated with socioeconomic conditions, overcrowding, poor sanitation, unsafe drinking water and limited access to healthcare. Globally, an estimated 44.3% of the population has been reported to harbour H. pylori, indicating its considerable public health importance. Transmission is believed to occur mainly through oral–oral and faecal–oral routes, including exposure to contaminated food or water and close contact with infected household members. Infection is often acquired during childhood and may persist for many years without treatment. It is important to distinguish H. pylori infection, serological exposure and active disease. Infection refers to the presence of the organism in the stomach, while serological exposure is indicated by the detection of antibodies produced in response to contact with the bacterium. Active disease refers to clinical conditions associated with the organism, such as gastritis and peptic ulcer disease. Diagnostic approaches include gastric biopsy, histology, bacterial culture, rapid urease testing, urea breath testing, stool antigen testing and serological antibody detection. Although urea breath and stool antigen tests are useful for identifying active infection, serological tests detect antibodies and may remain positive after the organism has been cleared; therefore, antibody positivity alone does not confirm current active infection (Okoye et al., 2026).

In Nigeria, studies have documented the presence of H. pylori among different population groups, including children and patients attending healthcare facilities, although reported prevalence varies according to the study population, geographical setting and diagnostic methods employed. However, findings from hospital-based studies may not adequately reflect exposure patterns among apparently healthy university students. University students constitute an important population for investigation because they experience shared accommodation, frequent social interactions and varying dietary and personal hygiene practices, which may influence exposure to H. pylori. Furthermore, students living on and off campus may experience different environmental and living conditions that could contribute to variations in exposure. Despite evidence of H. pylori in Nigeria and the wider northern region, information remains limited on the seroprevalence of H. pylori antibodies among university students in Maiduguri, particularly regarding how antibody positivity relates to demographic characteristics, accommodation, dietary habits, family history and personal hygiene practices. Consequently, the extent of serological exposure and the factors associated with antibody positivity in this population remain insufficiently characterised. Therefore, this study aimed to determine the seroprevalence of H. pylori antibodies and assess selected factors associated with antibody positivity among university students in Maiduguri, Borno State, Nigeria (Ayodele*et al*., 2026).

The prevalence of *H. pylori* infection varies between and within countries in relation with age, race, ethnicity, and geographical area of the population (Mynepalli*et al.*, 2014). Infectiosns are usually acquired in early childhood in most countries (Kuster*set al.*, 2006). The infection rate of children in developing nations is higher than in industrialized nations, probably due to poor sanitary conditions, perhaps combined with lower antibiotics usage for unrelated pathologies (Jemikalajah and Okogun, 2014). *H. pylori* infection is common worldwide with prevalence rates ranging from 30 to 40% in the United States, 80 to 90% in South America and 70 to 90% in Africa. It is more common in developing countries, and its prevalence increases with age from 20% among teenagers to 50 to 60% of subjects in the 6th and 7th decades of life (Adeniyi*et al.,* 2012). In a hyperendemic area like Nigeria, the determination of the true prevalence of *Helicobacter pylori* infection is best done with the use of biopsy-based methods, but for the purpose of epidemiological survey, rapid and easy screening for *H. pylori* infection can be achieved with the use of serological tests, despite their low discriminatory power between previous and current infection (Christopher *et al.,* 2010). Urea breath tests and stool antigen tests are most accurate for identifying *Helicobacter Pylori* infection and can be used to confirm cure. In addition, patient's serum could also be tested for the presence of anti-*H pylori* antibody. However, the level of awareness of this

bacterium, as a causative agent of peptic ulcer disease appears to be very low among student's population. Early detection of *H. pylori* infection might prevent peptic ulcer disease and its complications (Fashner and Gitu, 2015). Therefore, this study is directed towards the detection of *Helicobacter pylori* among University students in Maiduguri and continuously investigates the occurrence of the infection.

Aim of the Study

This study aimed to determine the seroprevalence of Helicobacter pylori antibodies and examine their association with selected demographic, dietary and hygiene-related characteristics among university students in Maiduguri, Borno State, Nigeria.

MATERIALS AND METHOD

Ethical Approval

Ethical approval for the study was obtained from the appropriate Research Ethics Committee of the University of Maiduguri, Borno State, Nigeria, before the commencement of the research. Permission was also sought from the relevant university authorities and faculties involved in the study. The purpose and procedures of the research were explained to all participants, and informed consent was obtained before blood sample collection. Participation was entirely voluntary, and participants were assured of the confidentiality and anonymity of their personal information and laboratory results. Blood samples were collected aseptically by trained personnel using sterile disposable syringes, and all specimens were handled and analysed in accordance with standard laboratory safety and ethical procedures. Participants were also informed of their right to withdraw from the study at any stage without penalty.

Study Area and Sample Collection

The study was conducted in a University in Maiduguri, Faculty of Life Science, Management Science and College of Medical Sciences between June and August 2019. The sample size for this study was 50. The blood samples were aseptically collected directly from 28 male and 22 female students from their venous using sterile 5 ml syringe and poured gently into the labelled EDTA container and transported to Microbiology Research Laboratory University of Maiduguri andanalysis where started immediately.

Microbiological Detection of *H. Pylori*

The blood samples were centrifuged at 1500 rpm for 15 minutes to separate the red blood cell and plasma, the *H. pylori* was detected using a Diaspot*H. pylori*Ab Rapid Test cassette. The sample plasma and buffer were dropped ones for rapid diagnostic of *H. pylori.* The plasma was pipette and drop to the serological strip hole and allowed to run for 10 minutes, positive was indicated with a tiny two pink line were as the negative results indicated only a pink line (Chessbrough, 2006).

Statistical Analysis

The data was analysed using Statistical Package for Social Sciences (SPSS) version XX. Descriptive statistics was used to calculate seroprevalence in percentages Chi-square test was used to determine association between socio-demographic variables (gender, age) and *H. pylori* infection. P-value=0.05 was considered statistically significant.

RESULTS AND DISCUSSION

The result of incidence of *H. pylori* among University students in Maiduguri showed that out of fifty (50) blood sample tested only 19 tested positives, given the seroprevalence rate of 38% while 31 sample which is 62% were negative. In the table 1 below, the table give distribution based on gender given the prevalence of female (n=22) was 45.5% while males (n=28) were 32.1%. The overall sample population is 38% although, it is not statistically significant (P-value =0.374).

In Table 2 results shows the distribution based on age which range from the 19 to 34. The highest numbers of positive samples were between (23-30) years with nine number of positive making 45%. Given the overall prevalence of 38% although, it is not statistically significant (P-value =0.080).

The table 3 gives the distribution based on Accommodation giving an incidence among student in the campus (n=22) was 31.8% while student that are in off Campus (n=50) was 42%. The overall sample population is 38% although, it is not statistically significant (P-value =0.074). In Table 4, distribution of *H.pylori* is based on marital status giving the prevalence of Married (n=5) was 40%. while among the Single (n=45) was 37.8%. For the role blood group in the incidence of the antibodies, blood group B+ (n=5) was shown to have highest seropositive students constituting an incidence of 50%. Statistical analysis showed a significant association between the incidence of antibodies and blood group (P-value =0.001).

Table 6 gives the distribution based on abdominal problem of *H. pylori* was detected in 57.9% and absent in 25%. Table 4.7 distribution of H. *pylori* base on family history is classified as either YES OR NO. The prevalence among YES (N=25) was 52% while among the NO (n=25) was 24%. The overall prevalence was 38% (P-value =0.328). Table 4.8: distribution of *H. pylori* base on meal taken per day which is classified as once, twice and thrice. The highest prevalence falls among thrice (n=16) was 44.4%. The overall prevalence was 38% statistical analysis showed that it is statistically significant (P-value =0.040). Table 9 distribution of *H pylori* base on food consumed which is classified based on the six classis of food. The highest prevalence (n=18) was 43.9% falls among the class of carbohydrate. The overall prevalence recorded in the sample was 38% is also statistically significant (P-value = 0.033). Table 10 distribution of H. *pylori* base on hand wash before meal shows highest prevalence falls among frequent hand wash (n=14) was 46.7%. The total prevalence among overall sample collected was 38% is also statistically significant (P-value = 0.042).

Table 1: Distribution of *H. Pylori* among Male and Female

Gender (Sex)	Total	Positive	Prevalence (%)
Male	28	9	32.1
Female	22	10	42.5
Total	50	19	38
(P-value =0.388)			

Table 2: Distribution of H. *Pylori* Based on Age

Age	Total	Positive	Prevalence (%)
19-22	20	7	35
23-25	20	9	45
26-28	7	2	28.6
29-31	2	1	50
32-34	1	0	0
Total	50	19	38
(P-value =0.080)			

Table 3: distribution of H. *Pylori* Base on Accommodation Status

Accommodation Status	Total	Positive	Prevalence (%)
On campus	28	7	31.8
Off campus	28	12	42.9
Total	50	19	38
(P-value =0.074)			

Table 4: Distribution of H. *Pylori* Base on Marital Status

Marital Status	Total	Positive	Prevalence (%)
Married	5	2	40
Single	45	17	37.8
Total	50	19	38
(P-value =0.150)			

Table 5: Distribution of H. *Pylori* Base on Blood Group

Blood Group	Total	Positive	Prevalence (%)
A^+	9	4	44.4
B^+	10	5	50
B-	2	0	0
AB^+	3	2	66.7
AB^-	1	1	100
O^+	23	7	30.5
O-	2	0	0
Total	50	19	38
(P-value =0.001)			

Table 6: Distribution of H. *Pylori* Base on Abdominal Problem

Abdominal Problem	Total	Positive	Prevalence (%)
Yes	19	11	57.9
No	31	8	25.8
Total	50	19	38
(P-value =0.328)			

Table 7: Distribution of H. *Pylori* Base on Family History

Family History	Total	Positive	Prevalence (%)
Yes	25	13	52
No	25	6	24
Total	50	19	38
(P-value =0.328)			

Table 8: Distribution of *H. Pylori* Base on Meal Taken Per Day

Meal Taken Per Day	Total	Positive	Prevalence (%)
Once	0	0	0
Twice	14	3	21.4
Thrice	36	16	44.4
Total	50	19	38
Not significant			

Table 9: Distribution of *H. Pylori* Base on Dietary Intake

Class of Food	Total	Positive	Prevalence (%)
Carbohydrate	41	18	43.9
Protein	7	0	0
Vitamins	2	1	50
Vegetables	0	0	0
Total	50	19	38
(P-value =0.033)			

Table 10: Distribution of *H. Pylori* Base on Hand Wash before Meal

Hand Wash	Total	Positive	Prevalence (%)
Frequently	30	14	46.7
Moderately	18	3	16.7
Rarely	2	2	100
Total	50	19	38
(P-value =0.042)			

Discussion

Helicobacter pylori is widely recognized as a major etiological agent of chronic peptic ulcer disease and other upper gastrointestinal disorders. In this study, the overall prevalence of *H. pylori* infection among 50 university students analyzed across demographic and lifestyle variables such as gender, age, accommodation, marital status, blood group, and dietary habits—was 38 %. This studies disagree to the findings of (Anduolo et al., 2015)which shows the prevalence was lower than the 79.3 % reported in the North-West region of Douala, Cameroon, 54.7 % observed in Latin America and the Caribbean, and 63.4 % reported among pregnant women in Nigeria (Mynepalli&Mumuni, 2014). It is also slightly below the global pooled prevalence of 44.3 %, which ranges from 50.8 % in developing countries to 15.5 % in developed ones (Hooi et al., 2017; Fock&Angi, 2010). Nevertheless, the prevalence recorded in this study is higher than the 34.7 % reported in some developed regions (Hooi et al., 2017) and far exceeds the 4.3 % global annual recurrence rate described by Smith et al. (2018).

Differences in *H. pylori* prevalence across regions can be attributed to several factors, including geographical variation, environmental sanitation, socio-economic conditions, and diagnostic techniques used to detect infection. In particular, lower living standards, limited healthcare access, and dietary patterns characterized by poor hygiene and high carbohydrate intake may contribute to elevated infection rates in developing settings such as Maiduguri. Regarding host factors, this study revealed no significant association between blood group O^+ and *H. pylori* infection (30.5 %), contrary to classical studies that linked this group to higher risks of duodenal and gastric ulcers (Dore et al., 2014). Instead, students with blood group B^+ exhibited the highest prevalence (50 %), suggesting that ABO antigens may influence bacterial adhesion and colonization patterns (Alkout et al., 1997). This aligns with earlier evidence that certain blood group antigens, particularly A and B, enhance bacterial attachment to gastric epithelial cells, thereby increasing infection likelihood. Conversely, other studies have reported no clear association between *H. pylori* and blood group phenotypes (Seydra et al., 2007), reflecting possible population-specific differences.

Dietary habits also played a notable role. Frequent consumption of carbohydrate-rich meals was significantly associated with infection, possibly due to changes in gastric pH and mucosal barrier integrity, which may favor bacterial colonization. However, factors such as accommodation type, marital status, and meal frequency showed no statistically significant associations. Interestingly, regular handwashing did not confer protection against infection, implying that transmission may not occur solely via the faeco-oral route but could involve oral–oral or gastric–oral pathways (Burgers et al., 2008).

Collectively, these findings emphasize the multifactorial nature of *H. pylori* transmission. Environmental hygiene, dietary composition, and host susceptibility appear to jointly determine infection dynamics. Therefore, awareness campaigns focusing on healthy feeding practices, sanitation improvement, and early screening are vital to reducing *H. pylori*-related morbidity among students and other young adults in Nigeria.

Conclusion

This study found that 19 of 50 university students (38.0%) in Maiduguri, Borno State, Nigeria, tested positive for *Helicobacter pylori* antibodies, indicating serological evidence of previous or current exposure among the sampled population. Variations in seropositivity were observed across demographic, clinical and behavioural characteristics; however, the small sample size, limited representation of some subgroups and uncertainties in the reported statistical analyses prevent reliable identification of independent associated factors. Furthermore, the use of an antibody-based rapid diagnostic test does not distinguish active infection from previous exposure, while the cross-sectional design prevents causal interpretation of the observed associations. The findings therefore provide preliminary information rather than a definitive estimate of active *H. pylori* infection among university students in Maiduguri. Further investigations involving larger, representative samples, validated diagnostic tests for active infection, clearly defined exposure variables and appropriate statistical analyses are recommended. Health education on gastrointestinal health, safe food and water practices, and access to appropriate diagnostic services should also be encouraged among students.

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