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Helicobacter Pylori Infection And Risk Factors Among Outpatient Attendees Of Jos And Bingham University Teaching Hospitals, Jos, Plateau State, Nigeria

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Abstract

Background: *Helicobacter pylori* (H. pylori) infection has assumed a global dimension, affecting half of the world's population and, therefore, remains a serious public health threat.

Methods: A cross-sectional study was conducted to determine the prevalence of *H. pylori* infection among patients attending Gastroenterology Clinics of two selected teaching hospitals in Plateau State, Jos, Nigeria. Patients were recruited as they presented at the clinics of the hospitals between July and September 2023. Patients with active bleeding, recent use of antibiotics or proton pump inhibitors were excluded. Self-administered structured questionnaires, in addition to laboratory-based proforma, were used to collect data. The seroprevalence of H. pylori and the fecal-prevalence were determined using a one-step rapid test device (Best *H. pylori* test kit, Ameritech Diagnostic Reagent- China) and immunochromatographic assay (Biotest Biotech, China) respectively. The data collected was cleaned, entered into Statistical Package for Social Sciences version 26.0 (Chicago IL, USA) software, and analyzed. The results were presented as tables, and a value of < 0.05 was considered statistically significant.

Results: Anti-*H. pylori* IgG antibody was detected in 89.0% of the patients, and *H. pylori* antigens were present in the stool of 37.0% of the patients. The 48.0% seroprevalence of *H. pylori* was higher among the patients aged 10- 30 years, and seroprevalence of 91.2 % among those aged 31- 60. Number of people living in a home were significantly associated with *H. pylori* infection ($p < 0.05$).

Conclusion: This study showed the presence of *H. pylori* in the community and recommends further study with a larger population size.

Keywords: Enzyme-linked immunosorbent assay, Helicobacter pylori, Immunoglobulin G, Antigen, Risk factors.

INTRODUCTION

Helicobacter pylori (H. pylori) infection has assumed a global dimension, but the impact of this infection is grossly felt in developing countries compared to the developed countries of the world (1, 2). *Helicobacter pylori* is a curved, spiral, or helical gram-negative bacillus, and it is non-sporing. Untreated *H. pylori* infection could last throughout life of the patient. It is estimated that half of the world population is infected with *H. pylori* and the infection varies depending on socio-economic status, overcrowding, and level of hygiene with the highest in developing countries: 53.0% in Egypt, 39.1% in Tanzania, 64.39% in Cameroon, 73.3% among children and 54.8% among adult in Kenya and 80.7% in Nigeria (3). The infection occurs during childhood and patients remain healthy carrier till adulthood before manifesting symptoms although majority of the population

do not develop symptoms to *H. pylori* infection (4). The mode of transmission is still not clear but believed to be spread from person to person through feaco-oral, oral-oral routes. In addition, lack of safe drinking water and basic hygiene, poor diet and living condition, smoking, meat consumption contribute to increased prevalence of this infection while consumption of chili pepper and co-existing parasitic infection are protective (5). *Helicobacter pylori* infection has over 1% - 2% infection risk of stomach ulcer and less than 1% risk of gastric mucosa-associated lymphoid tissue (6).

Different diagnostic methods for *H. pylori* infection have been developed and can be deployed as invasive and non-invasive tests. The infection can be diagnosed using culture,urea breath test,serological test, enzymes-linked immunoassay, polymerase chain reactionand *H. pylori* stool antigen(HpSA) test (7). In Nigeria, the non-invasive tests are not readily available except IgG serology and its value in a hyper-endemic country like Nigeria is limited due to low discriminatory power between previous and on-going infections. This study determined the *anti-H.pylori* IgG antibodies and HpSA among patient attending Medical Outpatient Department (MOPD) of Jos University Teaching Hospital(JUTH) and Bingham University Teaching Hospital(BhUTH), Jos, Plateau State, Nigeria.

MATERIALS AND METHODS

Study Area

The study was conducted in JUTH and BhUTH, Jos, Plateau State, Nigeria.

Clinical Evaluation and Selection of Patients

After obtaining informed written consent, patients were evaluated by collaborating clinicians at the MOPD of the respective hospitals. Patients who fulfilled the entry criteria were enrolled in the study. Personal data such as age, sex, marital status, and educational status, among others, were sourced from each patient and entered into the study standard form. The patients were recruited as they presented at the clinics of the respective hospitals (July to September 2023).

Participants were selected according to the following inclusion criteria: volunteers who signed the informed consent form and were not on any anti-H. pylori treatment within four weeks prior to sampling and those with clinical signs of H. Pylori infection were included. Patients who were less than 10 years old or were treated with antibiotics within four weeks of the study enrolment were excluded.

Ethical Consideration

Ethical approval was sought and obtained from the Ethics and Research committees of JUTH; DCS/IRE/127/XXX/431) and Bh.UTH; NHREC/21/05/2005/01002)

Blood sample Collection and Detection of Anti-*H. Pyori* Ig G Antibodies

Five milliliters (5mls) of blood were aseptically collected by a trained phlebotomist from each patient for *H. pylori* antibody tests and immediately taken to the laboratory for processing and according to the standard operating procedure of the hospitals.

The harvested sera were tested for anti-H pylori IgG antibody (A*Hp* IgGA) using rapid test kits (Best *H. pylori* test kit, Ameritech Diagnostic Reagentm, China). This rapid test kit has a label *T* and *C* as "Test Line" and "Control Line" on the surface of the device respectively. Both the test line and control line in the result window are not visible before applying any samples. The control line is used for procedural control. The control line should always appear if the test procedure is performed properly and the test reagents in the control line are working.

Stool Sample Collection and Detection *H. pylori* Stool Antigen

Stool specimens were collected from each patient

for *H. pylori* antigen and immediately taken to the laboratory for processing and analysis.

Rapid test kit (Biotest Biotech, China) was used to determine feco-prevalence of *H. pylori* according to the manufacturer's instruction. Fecal specimens (2g) were collected into a clean dry labeled container. The specimen was randomly stabbed with the collection applicator in three different sites so as to collect approximately 50mg (two drops [80µl], for liquid specimen) of feces into the extraction buffer tube, properly mixed, and allowed to stand for two minutes. Two full drops of the extracted specimen were transferred to the specimen well of the test cassette, and the timed for 10 minutes at room temperature. The result was read with two colour bands appearance on the membrane.

Interpretations of result: positive-two lines appeared, one red line was in the control line region (C) and another apparent red line was in the test line region (T). Negative – one red line appeared in the control region (C) and no line appeared in the test line region (T).

Statistical analysis

The collected data was cleaned, entered into Statistical Package for Social Sciences version 26.0 (Chicago IL, USA) software and analyzed. The results were presented as tables. Chi square test was used to determine the association between categorical variables at 95% Confidence Interval (CI) and p-value of < 0.05 was considered statistically significant.

RESULTS

The results of the hundred (100) patients studied which comprised of 42 males and 58 females, revealed 89.0% seropositivity for AHp IgGA and37.0% were positive for *H. pylor*i stool antigens (HpSA). Male patients had a higher seropositivity for AHp IgGA (92.9%) compared to their female counterparts (AHpIgGA= 86.2%). There was no statistically significant association between *H. pylori* seropositivity and gender of the patients (p=0.30). The prevalence of AHp IgGA increased with age group from 10-30 years (88.0%)to age group 31-60 years (91.18 %) and decreased (71.40%) at age group of 61-90 years. There was no significant association between *H. pylori* seropositivity and age of patients (p=0.30).

With respect to marital status, 89.9% of the married patients were positive for AHp IgGA, while 87.1% of the singles (unmarried) patients were positive for AHp IgGA. There was no statistically significant association between *H. pylori* seropositivity and marital status of the patients (p=0.70). Results according to education, revealed that 89.6% of the seropositive (AHp IgGA) individuals were educated, while for non-formal educated counterparts, it was 75.0% (p=0.40).

Considering the occupation of patients, seropositivity increased from among the business individuals (AHpIgGA= 87.5%) to the civil servants (AHpIgGA = 88.5%) and peaked among the unemployed (AHpIgGA = 91.2%). The difference is not statistically significant association (p=0.90) (Table 1).

Male patients had a higher feco-prevalence (HpSA=37.9%) than female patients (HpSA=35.7%). There is no significant relationship between sex and *H. pylori* infection (p=0.82).

The feco-prevalence decreased from 10-30 years (HpSA = 48.8%) to 31-60 years (HpSA=33.8%) and 61-90 years (HpSA=28.6%). There was no significant association between HpSA positivity and patients' age (p=0.41).

With respect to marital status, 33.3% of the married patients were positive for HpSA, while 45.2% of the unmarried patients were positive for HpSA. There was no statistically significant association between HpSA positive and the patients' marital status (p=0.26).

With respect to education, 36.5% of the educated patients were positive for HpSA, while for non-formal educated counters, it was 50.0%.

Considering the occupation of patients, HpSA positivity decreased from among the unemployed

individuals (50.0%) to the business participants (32.5%) and to the civil servants (26.9%). The difference is not statistically significant (p=0.14) (Table 2).

Patients whose water source is well-had seroprevalence of 91.7% (22/24) and feco-prevalence of 37.5% (9/24). Patients whose source of water is borehole had seroprevalance and fecoprevalence of of 90.2% (37/41) and 36.6% (15/41) respectively.For those who use other source of water, data revealed a sero-prevalence of 85.7% (30/35) and a feco-prevalence of 37.1% (13/35). This difference is not statistically significant (p=0.99).

Regarding hand washing, patients who wash their hands regularly had seroprevalence of 87.1% (61/70) and feco-prevalence of 31.1% (26/70), while for those who do not wash their hands regularly, it was 93.3% (28/30) and 36.7% (11/30).

Similarly, for the number of people living in a home: Family of 1-5 had sero-prevalence of 80.9% (38/47) and feco-prevalence of 38.3% (18/47), while the families of 6-10 seroprevalence of 96.1% (49/51) and feco-prevalence of 37.3%) and for family of 11 and above, the seroprevalence was 0.0% (0/2) and feco-prevalence 100% (2/2). This difference was statistically significant (p=0.05).

In relation to patients who take alcohol, our data revealed a seroprevalence of 83.3% (10/12) and a feco-prevalence of 33.3% (4/12), while those who did not take alcohol had a seroprevalence of 89.9% (79/88) and a feco-prevalence of 37.5 % (33/88).

With respect to smoking, those who smoke had seropositivity of 66.7% (2/3) and feco-prevalence of 66.7% (2/3), while those who do not smoke had seropositivity of 89.7% (87/97) and feco-prevalence of 36.1% (35/97) (Table 3).

Table1: Sero-prevalence of *H. pylori* and Socio-demographic characteristics of the Patients

Variable	No examined (n=100)	No Positive (%) (n=89)	χ2	p value
Gender			1.100	0.30
Male	42	39(92.9)		
Female	58	50 (86.2)		
Age (years)			2.562	0.30
10-30	25	22(88.0)		
31-60	68	62(91.2)		
61-90	7	5(71.4)		
Marital status			0.166	0.70
Married	69	62(89.9)		
Unmarried(single)	31	27(87.1)		
Education			0.834	0.40
Yes	96	86(89.6)		
No	4	3(75.0)		
Occupation			0.264	0.90
Business	40	35(87.5)		
C/Servant	26	23(88.5)		
Unemployed	34	31(91.2)		

χ2= Chi-square

Table 2: *H. pylori* Stool Antigen and Socio-demographic characteristics of patients attending MOPD of JUTH and Bh.UTH, Jos, Plateau State

Variable	No examined (n=100)	No Positive (%) (n=89)	χ2	p value
Gender			0.051	0.82
Male	42	15(35.7)		
Female	58	22(37.9)		
Age (years)			1.805	0.41
10-30	25	12(48.0)		
31-60	68	23(33.8)		
61-90	7	2(28.6)		
Marital status			1.284	0.26
Married	69	23(33.3)		
Single	31	14(45.2)		
Education			0.302	0.58
Yes	96	35(36.5)		
No	4	2(50.0)		
Occupation			3.945	0.14
Business	40	13(32.5)		
Civil servant	26	7(26.9)		
Unemployed	34	17(50.0)		

χ2 = Chi-square

Table 3: *H. pylori* Stoolantigen, Anti-*H. pylori* antibody and Risk factors among the patients

Risk factors	No examine (n=100)	No positive (%) (n=89) Feco-positive	No positive (%) (n=89) Sero-positive	χ2	p value
Source of drinking water					
Well water	24	9 (37.5)	22(91.7)	0.06	0.99
Bore hole	41	15(36.6)	37(90.2)		
Other source	35	13(37.1)	30(85.7)		
Hand washing					
Yes	70	26(37.1)	61(87.1)	0.002	0.96
No	30	11(36.7)	28(93.3)		
No of people in the Home				6.046	0.05
1-5	47	18(38.3)	38(80.9)		
6-10	51	19(37.3)	49(96.1)		
11-above	2	(00.0)	2(100)		
Alcohol				0.079	0.78
Yes	12	4(33.3)	10(83.3)		
No	88	33(37.5)	79(89.9)		
Smoking				1.168	0.28
Yes	3	2(66.7)	2(66.7)		
No	97	35(36.1)	87(89.7)		

χ2 = Chi-square

DISCUSSION

This study presents the sero- and feco-prevalence of *H. pylori* among patients attending the MOPD of two selected hospitals in Jos, Plateau State. The overall seroprevalence of *H. pylori* infection among patients in the two hospitals was high. Our report was in disagreement with the work of Ombugadu *et al.* (8), who reported a seroprevalence of 35.0% among dyspeptic patients in JUTH. It is also higher than the seroprevalence of 72.4% reported by Okoroiwu et al. (9) among participants from three local Government Areas in Imo State and the seroprevalence of 52.0% reported by Nwachukwu *et al.*(10) among patient with gastritis attending Nnamdi Azikiwe University Teaching hospital, Nnewi, Anambra, State, Nigeria. Our data is also higher than the report of Miernyl *et al.* (11), who documented a prevalence of 68.0% Helicobacter pylori infection among Alaskans in the United States of America, and that of Elshair *et al.* (12), who reported a prevalence of 42.8%. These differences might be due to differences in the concentration of antibodies and their persistence in the study participants' blood, the sensitivity of diagnostic kits used, and the techniques employed (13).

The overall feco-prevalence of *H. pylori* infection in this study was 37.0 %. This is similar to the findings of Odigie *et al.* (14), who reported a feco-prevalence of 34.2% among treatment-naive dyspeptic adults at the University of Benin Teaching Hospital, Benin City, Nigeria. Our data, however, disagrees with the findings of Agi *et al.* (15), who reported a higher *H. pylori* feco-positivity of 55.5% among patient

presenting with presumptive gastritis in River State University, Nigeria and a lower feco-prevalence of 24.9 % in Addis Ababa Ethiopia among gastritis patients in Yekatit Teaching Hospital Addis Ababa Ethiopia (16) The differences in these findings may be due to variation in socio-demographic factors, sources of drinking water, type of diagnostic kits and sample size.

This study revealed that the seroprevalence of *H. pylori* infection was higher among males than their female counterparts. This is consistent with the work of Emerenini et al. (17), who also reported a higher seroprevalence of 56.7% in males compared to females (43.3%) among children in Owerri state, Nigeria. This might result from the potential exposure of males to infections in the environment. Men also tend to be street credible, unlike females, who are mostly indoors and conservative.

Our study revealed that adults have higher seroprevalence than younger and older patients. This agrees with the study conducted in Lagos by Mynepalli *et al.* (18), which had a higher prevalence (53.3%) in adults, even though an earlier study carried out by Khan (19) among different age groups showed no significant association between age and *H. pylori* infection. The finding supports the notion that *H. pylori* infection could arise from childhood to advanced age (4). Overcrowding and deprivation seem to favor the acquisition of infection in childhood.

Our data showed the married had higher sero-prevalence than the unmarried. Reports revealed that a strain of *H. pylori* has been isolated from husband and wife, raising the possibility of transmission between spouses (20). However, epidemiological studies have not definitively confirmed living with a partner as a factor associated with prevalence for infection (20). The seroprevalence of this study does not correspond with the report of Ombugadu *et al*. (8), who reported the highest prevalence of H. pylori (48.6%) among singles. The reason could be that one sample population was considered against the two locations used in this study. Up to 89.6% of educated subjects were seropositive compared to 75.0% uneducated, which agrees with the work of Attila *et al.* (21), who reported a prevalence of 91.9% among school children in Uganda. This does not agree with the study of Wernly *et al.* (22) carried out in central Europe, where the uneducated had a higher prevalence of 21% compared with the medium and educated of 17% and 15%, respectively. It does not also correspond with the study of Odigie *et al.* (14) conducted in Benin, Nigeria, as those with no formal education had the highest prevalence of 41.0%, possibly due to different methods used in the study. Education may not have played a role in acquiring and transmitting *H. pylori* in the study area as many people are ignorant of the bacterial agent. However, research conducted by Hamrah *et al*.(23) in Afghanistan found an association between illiteracy and rural dwelling with *H. pylori* infection, as the educated population was more knowledgeable about hygiene.

Our report revealed that unemployed participants have the highest prevalence, followed by public servants and business participants. This agrees with the study of Hamrah *et al*. (23), whose findings showed that the employed patients had a low *H. pylori* infection prevalence, which can be justified by the better living conditions among families with a higher income. However, this finding does not correspond to the findings of Odigie *et al.*(14) conducted in Benin, who reported seroprevalence of 87% among professional workers. This could be a result of the different sample sizes used.

For *H. pylori* Antigen in stool, females have a higher prevalence than males, and it is not statistically significant (p=0.82). This agrees with the study done in North Central Nigeria using biopsy endoscopy by Zawaya *et al.* (6), with a female prevalence of 67.3%. In this study, the *H. pylori* Antigen in the stool of the participants revealed a prevalence of H. pylori infection to be higher in younger ages at 48% than in other age brackets, which shows that the infection is acquired mostly during childhood age. But for *H. pylori* in stool, the unmarried had a higher prevalence of 45.2% than the married 33.3%(p=0.26); however, there is no significant value with marital status. This agrees with the Ombugadu *et al.*(8) study conducted in Jos, North

Central Nigeria, which had the highest prevalence (48.6%) among the singles. Epidemiological studies have not confirmed living with a partner as a factor associated with the prevalence of infection (20).

We reported in this study 50.0% of the HpSA among the uneducated participants, which agrees with the study of Wernly *et al.* (22) carried out in central Europe, where the uneducated had a higher prevalence of 21%. This study also corresponds with the study of Odigie *et al.* (14) conducted in Benin, Nigeria, using similar methods of stool antigen test where subjects with no formal education had the highest prevalence of 41.0%, though higher than that obtained in this study.

The unemployed in this study had a prevalence of half. This does not correspond with the report of Odigie *et al* .(14), who reported 87.0% among professional workers. This could be due to the smaller sample size used in our study.

We also observed that *H. pylori* infection was high among patients with well water drinking water. This is in line with the study of Mnena *et al.* (24) but differs from the study of Chukwuma *et al.* (25), in which sachet water had the highest prevalence of 31.8%. Open well water is a water source for many households, and studies have found that contaminated water is a source of *H. pylori* infection (26). Also, those who do not wash their hands regularly had a higher prevalence than those who wash their hands, which indicates that the infection rate is associated with knowledge and level of hygiene.

This study showed that serological evidence of *Helicobacter pylori* increases with an increasing number of people living together in the home. This is in line with the study conducted in the western part of Nigeria (27) and some studies done in Africa (28). Overcrowding is a major factor for *H. pylori* infection.

Subjects who do not take alcohol showed a higher prevalence (89.8%) than those who take alcohol (83.3%) in serum IgG. This is in line with the study of Zawaya *et al.* (6). *Helicobacter pylori* shows no statistical significance in serum IgG (p=0.50). Alcohol consumption may inhibit the living condition of *H. pylori* in the stomach as alcohol has strong antimicrobial activity and causes the secretion of gastric acid (29).

Helicobacter pylori relationship with smoking shows no statistical significance (p=0.21) in serum IgG. Subjects who do not smoke (89.7%) have higher seroprevalence than those who smoke (66.8%); this study does not agree with the study of Zawaya et al. (6) as it reported that those who smoke cigarettes had a higher prevalence of *H. pylori.* Smoking has been associated with the acquisition and increased persistence of *Helicobacter pylori* infection and with lower effectiveness of its eradication (30).

In stool antigen, well water had the highest prevalence of 37.5%, which is in line with the study of Mnena et al. (24), which showed 33.3%. This is lower than the current study, which could be due to the different study populations. There was no statistical significance in the source of drinking water (p=0.99). Unsafe drinking water is a source of contamination, and most well water is unsafe as it is kept open and drawn out with any available material, not considering its hygiene level. The stool fico-prevalence of those who wash their hands often is higher than those who do not often wash their hands. There is no significant difference between hand washing and *H. Pylori.* This is in line with the study of Mynepalli *et al.* (18), with a 72.9% prevalence of those who frequently wash their hands after defecation. *Helicobacter pylori* decreased with an increasing number of people living at home in stool antigens, showing 38.3% and 37.3%. The statistical value (p=0.55) in the stool antigen does not correspond with the findings of Awuku *et al.* (28).

Similar to findings from other studies, the prevalence of *H. pylori* was significantly higher among respondents living in rural settlements and those with a high number of household occupants. Gunaid *et al.* (30) reported a higher prevalence of *H. pylori* infection among families whose size equals or exceeds 6 members. Similarly, Santos *et al.* (31) found a higher prevalence of 69.7% in families with more than 4 children or relatives as compared

to 58.5% in families with less than 4 children or relatives. In respect to alcohol: *Helicobacter pylori* shows no statistical significance in stool antigen (p=0.78). Subjects who do not take alcohol showed a higher prevalence (37.5%) than those who take alcohol (33.3%) in stool Antigen respondents, which is also in line with the study of Ombugadu *et al*. (8) andZawaya *et al.* (6).

Helicobacter pylori in relationship with smoking showed no statistical significance (p=0.28)in stool Antigen. Those who smoke have a higher prevalence than those who do not smoke cigarettes and also agreed with the study of Zawaya *et al.* (6).

LIMITATION

The study was conducted at the health facilities. the data, being hospital-based may thus not be easily extrapolated to the population, but patients with untreated *H. pylori.*

CONCLUSION

There is evidence of *H. pylori* infection in the community studied. The risk factors identified were age and the number of people living in a home. The *H. pylori* stool antigen test, apart from being noninvasive and easy to carry out, is useful in detecting current infection and comparable to the IgG serology in determining the prevalence of *H. pylori* in MOPD patients.

RECOMMENDATION

A larger community-based study with information on strains of *H. pylori* and local cut-off values is suggested in order to further evaluate the usefulness of these tests and compare with histology, presently rated as the gold standard. The community also need be educated on the importance of hygiene.

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