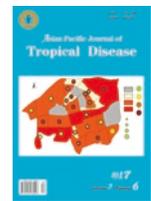


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Prevalence and predictors of *Helicobacter pylori* infection among patients attending a healthcare facility in North-Central Nigeria

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## ABSTRACT

**Objective:** To evaluate the prevalence and predictors of *Helicobacter pylori* (*H. pylori*) infection among patients attending a healthcare facility in Nigeria.**Methods:** Blood samples were collected between July–August, 2016 from 240 patients who gave informed consent and completed self-administered questionnaires. Out of the 240 subjects, 101 (42.1%) were male and 139 (57.9%) were female. Plasma samples were examined for anti-*H. pylori* IgG antibodies using a commercial antibody-based kit.**Results:** Out of the 240 subjects, 135 (56.3%) were seropositive. Of these, 53 (52.5%) males and 82 (59.0%) females were infected. Age and alcohol consumption were significant predictors of infection ( $P < 0.05$ ). Although subjects who were female, married, full time house wives and lived in urban areas were more likely to be infected, there was no statistically significant difference ( $P > 0.05$ ).**Conclusions:** Infection with *H. pylori* was found among patients attending a tertiary healthcare facility in Nigeria. High proportions of patients (56.3%) were infected in the study area. Our findings have public health significance for the prevention and control of the infection in Nigeria.

## 1. Introduction

*Helicobacter pylori* (*H. pylori*), with helical shape, is a Gram negative, microaerophilic bacterium that can reside in various locations of the stomach particularly the antrum. It causes a chronic low level inflammation of the stomach lining and is linked to the occurrence of duodenal, gastric and abdominal ulcer[1,2]. *H. pylori*, the principal species of *Helicobacter*, is common in human and is responsible for myriad gastro-duodenal pathologies. Studies have reported the infection rates to be higher in developing countries especially Nigeria[3]. Although epidemiological investigations have addressed different factors such as bacterial host, genetic and environmental factors to evaluate the causative links to the infection, knowledge of reservoirs and transmission is still not yet clear[3].

This infection is spread among human populations and considered to be of significance in the pathogenesis of several gastro-duodenal diseases including duodenal ulcer, peptic ulcer and gastric mucosa associated lymphoid tissue (MALT) lymphoma. Previous studies showed that about 50% of adults in developed countries and nearly 90% in developing countries are positive for serum antibodies against the bacterial[4,5]. Despite advances in the understanding of the biology of *H. pylori*, the factors that determine the outcome of infection are not yet clear. Although the host factors might be significant regarding the outcome of the infection by this organism, bacterial factors seem to have effect on the inflammatory response and the development of a fulminant pathology. Cytotoxin associated antigen A (CagA) seems to be the major virulence factor involved in the pathogenesis of *H. pylori* infection[6]. The acquisition of *H. pylori* seems to occur mostly in the childhood[2].

The organism differs genetically, is ubiquitous and can resist stressful conditions such as gastric acid which kills most other bacteria entering the stomach with contaminated food or water[7]. The bacterium adapts to colonize and survive in the harsh acidic gastric environment specifically. It has the ability to adhere and

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invade host defenses and cause tissue damage due to its colonization and production of virulence factors. The organism has numerous virulence factors which are cytotoxin, flagella, lipopolysaccharides, adhesins, urease, vacuolating cytotoxin A (Vac A) and cytotoxin antigen A[4]. The clinical outcome of long term infection varies and is considered to correlate with bacterial virulence factors[8] and host gene. The cytotoxin pathogenicity and the cytotoxin antigen A are two identified virulence factors considered to play a significant role in the pathogenesis of the infection[2].

Transmission probably occurs mainly by faecal-oral routes and via contaminated food, water and unclean hands[3]. Oral-oral transmission has also been identified in the case of African women who pre-masticate foods given to their babies[8]. Most individuals infected with *H. pylori* are usually asymptomatic carriers. However, others develop serious diseases including peptic and duodenal ulcers. Symptoms associated with the ulcer include pain (usually in the upper abdomen), feeling full after eating a small amount of food, loss of appetite, nausea, vomiting, dark colored stool, belching – noisy oral emission of gas, mainly swallowed air from the gullet and stomach, and flatulence – gastric and intestinal distention with gas[9].

There is a paucity of information on *H. pylori* infection in Nigeria especially the north-central part of the country. The present study, therefore, aimed to determine the prevalence and predictors of *H. pylori* infection among patients attending healthcare facility at the Federal Medical Centre, Keffi, North-Central Nigeria.

## 2. Materials and methods

### 2.1. Study area and population

This study was conducted in Keffi, Nasarawa State. It is approximately 68 km from Abuja, the Federal Capital Territory and 128 km from Lafia, the state capital. Keffi (8°5' N, 7°8' E) is situated on an altitude of 850 m above sea level[10].

A cross sectional study was conducted among patients attending healthcare facility at the Federal Medical Centre, Keffi, Nasarawa State, from July to August 2016. Two hundred and forty patients who gave informed consent were recruited for the study. Socio-demographic data and relevant information were collected using questionnaires.

### 2.2. Sample collection

About 5 mL of venous blood was collected from each participant in Vacutainer tubes. A tourniquet was applied to the upper arm of the patient (to enable the veins to be seen and felt) and the patient was asked to make a tight fist (to make the veins more prominent). The puncture site was disinfected with sterile alcohol and with the thumb of the left hand holding down the skin below the selected puncture site, a vein was punctured with the bevel of the needle directed upwards in the line of the vein. When sufficient blood had been

collected, the tourniquet was released and the patient was instructed to open his or her fist. The collected blood samples were transported in a cold box to Innovative Biotech Limited for analysis.

### 2.3. ABO blood grouping

The ABO blood grouping was carried out by slide agglutination test using monoclonal antibodies (A, B and D) to determine possible association with the different blood groups. A drop of blood was dropped on a clean white tile in three places in a vertical row. A drop of anti-A, anti-B, and anti-D was added respectively. Each sample was mixed evenly using glass rods. The different blood groups were determined based on agglutination of test serum by the respective antiserum as method described by Cheesbrough[11].

### 2.4. Detection of *H. pylori* IgG antibodies in plasma

After blood grouping was done, centrifugation was done at 200 r/min for 5 min to separate plasma from the blood. Serological status of the bacterium was determined using a commercially available *H. pylori* serology kit (Clinotech) according to the manufacturer's instructions. The test device was removed from and placed on a clean flat surface; it was labeled with specimens' identification number; the pipette dropper was filled with specimen and a drop was dispensed into the sample well, making sure that there were no air bubbles; a drop of sample buffer was added immediately and the results were read in 15 min.

### 2.5. Statistical analysis

The data gathered were analyzed using the statistical software SPSS version 15.0 (SPSS Inc, Chicago, USA). Pearson *Chi*-square test was conducted at 95% confidence interval. *P* values  $\leq 0.05$  were considered significant statistically.

### 2.6. Ethical approval

In line with the Helsinki Declaration which specifies the code of ethics for biomedical research involving human subjects, clearance for this study was obtained from the Health Research Ethics Committee at the Federal Medical Centre, Keffi, Nasarawa State, Nigeria.

## 3. Results

A total of 240 patients participated. Overall, 135 (56.3%) participants had anti *H. pylori* antibodies. The highest prevalence of 64.0% was recorded in patients with B blood group, although blood group O had the highest number of positive cases. Age and alcohol intake were both significant determinants of recent cases of the infection in the study area. It was highest in those aged 60–69 and

70–79 years old (100%) and the least prevalence occurred among those aged less than 20 years old (47.1%). The prevalence was higher (83.0%) among those that take alcohol and lower (49.7%) among those that do not take alcohol ( $P < 0.05$ ). However, gender, occupation, location, marital status and diets of patients were not risk factors of *H. pylori* infection ( $P > 0.05$ ) (Table 1).

**Table 1**

Prevalence of *H. pylori* infection among patients in relation to risk factors studied in Federal Medical Centre, Keffi, Nigeria

Variables	No. of patients screened	No. of patients positive (%)	P value
Blood group			
O	108	57 (53.8)	0.7
A	60	33 (55.0)	
B	50	32 (64.0)	
AB	22	13 (59.1)	
Age (years)			
< 20	34	16 (47.1)	0.02
20–29	95	54 (56.8)	
30–39	55	28 (50.9)	
40–49	28	14 (50.0)	
50–59	13	8 (61.5)	
60–69	10	10 (100)	
70–79	5	5 (100)	
Gender			
Male	101	53 (52.5)	0.3
Female	139	82 (59.0)	
Occupation			
Farmer	72	40 (55.6)	0.1
Civil servant	30	19 (63.3)	
Housewives	21	16 (76.2)	
Student	117	60 (51.3)	
Location			
Rural	175	97 (55.4)	0.5
Urban	65	38 (58.5)	
Marital status			
Married	116	72 (62.1)	0.2
Single	100	51 (51.0)	
Under age	24	12 (50.0)	
Alcohol intake			
Yes	47	39 (83.0)	0.001
No	193	96 (49.7)	
Diets			
Spicy foods	128	78 (61.0)	0.1
Non-spicy foods	112	57 (50.9)	

#### 4. Discussion

Above 50% of the world's population are infected with *H. pylori*[12]. Our findings reveal the prevalence of *H. pylori* (56.3%) among patients attending healthcare facility at the Federal Medical Centre, Keffi, Nasarawa State, Nigeria. This report is similar to the findings of Abiodun *et al.* in Ibadan, Ogun State[3], Etukudo *et al.* in Uyo, Akwa Ibom State[13] and Oluyemi *et al.* in Lagos[5], Nigeria. However, the prevalence of this present study is lower than report from Ghana which recorded a prevalence of 75.4% among dyspeptic patients[4], reports from Saudi Arabia and Kuwait showing the prevalences of 68% and 62%, respectively[14,15].

Several studies had recorded higher frequency of the blood group O and the non-secretor phenotype of ABH antigens among

sufferers of peptic ulcer. Since the bacterium has been established as the main causative agent of the disease, speculations about the association of the ABO blood groups and secretor and non-secretor phenotypes with susceptibility to infection with this bacterium have been presented[16]. The findings of this study support the epidemiological view of the greater susceptibility of blood group O to the infection, which are in line with the conclusion of Syam *et al.* who demonstrated that the H-antigen in blood group O is an important receptor expressed in the gastroduodenal mucosa cells to which the bacterium attaches, which also facilitates colonization of the bacterium[17]. The higher susceptibility of the blood group O individuals is might be due to the higher frequencies of secretor status in blood group O individuals[18]. Blood group B and AB patients were less prone to *H. pylori* infection than patients with other blood groups in this study which is not consistent with other studies[19]. This study does not demonstrate any association of *H. pylori* serological status of patients with the different blood groups, which is in consonance with similar studies from other countries[20].

In this study, a gradual increase in prevalence of *H. pylori* infection with age (47.1% in those aged < 20 years to 100% in those aged 60–79 years) was observed. Similar findings have been reported in other studies indicating a high frequencies in the elder[6,17]. This tendency is believed to be related to the environmental factors specific to these age groups rather than aging[17]. There is an association between the bacterial infection and age of the patients ( $P < 0.05$ ).

The result of this study reveals that the seropositivity of *H. pylori* infection is higher in females (59.0%) than males (52.5%), which are consistent with report from Iraq showing the prevalence of 62.3% in females and 37.7% in males[16]. Other studies have reported a higher prevalence of *H. pylori* infection in males, which may be attributed to greater chances of males to be exposed to potential environmental sources of infection and alcohol intake[21]. No association between gender and *H. pylori* infection was recorded. It is in line with report from Iraq showing no significant association[17].

With reference to occupation, housewives recorded the highest prevalence (76.2%), followed by civil servants (63.3%), farmers (55.6%) and the least prevalence was recorded among students (51.3%). This disagreed with the finding of Archampong *et al.* which recorded the highest prevalence among unemployed people (92.3%) and farmers (91.7%) respectively[4]. There was no association between bacterial infection and occupation. There was no statistically significant association between the bacterial infection prevalence and locality ( $P > 0.05$ ). The prevalence was higher among patients living in the urban setting (58.5%) than that among the rural setting occupants (55.4%) ( $P > 0.05$ ). This might be connected with the exposure to environmental pollution and other risk factors that facilitate the acquisition of the infection.

Similarly the bacterial infection was not associated with marital status. There was a prevalence of 62.1% among married patients and 50.0% among those under aged.

Histories of alcohol (local alcohol like burukutu) consumption

appear to be a determinant for the infection which is in consonance with report by Zhang *et al.*[22]. However, similar findings from other countries have been reported[21] showing no association between *H. pylori* infection and alcohol consumption. This might be due to the differences in the brands of alcoholic beverages consumed.

A higher prevalence of the infection was reported among patients eating spicy foods (61.0%) than that among those eating non spicy food (50.9%). However, no association was observed in the present study ( $P > 0.05$ ). Blood group O individuals are more prone to *H. pylori* infection and they have more cellular immunological responses to it. Females are more prone to the infection than males[23].

The findings confirm that the infection is endemic in Nigeria, and action towards appropriate prevention and control measures is needed. Community health personnel should educate the populace on hygiene practices to reduce the risk of contracting infection with the bacterium which often occurs during childhood.

### Conflict of interest statement

We declare that we have no conflict of interest.

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