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**Prevalence and associated risk factors of *Helicobacter pylori* among Residents of Abuja Municipal Area Council (AMAC) FCT, Abuja.**

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Author for Correspondence\*: okoroiwugia@yahoo.com/+234-803-667-7539.  
<https://dx.doi.org/10.4314/sokjmls.v10i1.18>**Abstract**

*Helicobacter pylori* is a spiral-shaped gram-negative microaerophilic bacterium presently affecting approximately one half of the world population and causing chronic gastritis. This study was conducted to determine the prevalence of *Helicobacter pylori* and associated risk factors among residents of AMAC, FCT, Abuja. A total of 422 participants were recruited. Socio-demographic characteristics of each participant and potential risk factors were collected with a structured questionnaire. Faecal samples were collected for detection of *Helicobacter pylori* antigen using a one-step *H. pylori* antigen test device. Data collected were analyzed using Statistical Package for Social Sciences, version 25.0. The result showed that out of 422 screened for the infection, 214 (50.7%) were infected with *H. pylori*. Female were the more infected (53.0%) than male (47.0%). Age groups mostly affected were those in 31-40 years (58.5%), 41-50 years (57.3%), and 21-30 years (54.3%). The analysis of the data showed that informal education ( $p = 0.001$ ), unemployment ( $p = 0.001$ ), drinking pipe-borne water ( $p = 0.011$ ), living in crowded room ( $p = 0.011$ ), consumption of food from vendor ( $p = 0.001$ ), frequent use of NSAIDs ( $p = 0.012$ ), eating raw vegetable and unwashed fruits ( $p = 0.035$ ) and experience of gastric-related symptoms ( $p = 0.008$ ) were found to be risk factors associated with *H. pylori* infection. Gender ( $p = 0.155$ ), washing hands before meals ( $p = 0.143$ ), smoking ( $p = 0.320$ ) and family history ( $p = 0.317$ ) were not significantly associated with *H. pylori*. There is need for increased public awareness on *H. pylori* infection.

**Keywords:** Prevalence, *Helicobacter pylori*, Residents, AMAC, Abuja, Gender, Age.**Introduction**

*Helicobacter pylori* (*H. pylori*) is a spiral-shaped, Gram-negative microaerophilic bacterium, measuring approximately 3–5  $\mu\text{m}$  in length, presently affecting approximately one half of the world population and causing chronic gastritis, the most frequent chronic inflammation worldwide (Luigi, 2018). Infection is mostly asymptomatic, but could cause pathologies such as gastritis, gastric and duodenal ulcers and about 90 - 100% of all duodenal ulcers, and 70 - 80% of all gastric ulcers are caused by *H. pylori* infection (Pizzornor *et al.*, 2016). An International Agency for Research on Cancer (IARC), an arm of the World Health Organization (WHO) classified *H. pylori* as a class I carcinogen for gastric cancer, a definition given to highest cancer-causing microbial agent (IARC, 1994).

*Helicobacter pylori* (*H. pylori*) is a ubiquitous gram-negative bacterium that selectively colonizes the gastric epithelium and infects over half of the global population. Its prevalence varies between countries and among racial groups resident within the same country. It presents with non-specific dyspeptic symptoms with a varying range of severity. In general, children and adults in developing countries are more infected than developed countries. This may be because of factors such as poor sanitation and lack of potable water supply in developing countries (Emerenini *et al.*, 2021). There is evidence that *H. pylori* infection is primarily

acquired early in life and once established, persists in the individual into adulthood. The exact route of transmission is not clear though human-to-human transmission either through faeco-oral or oro-oral routes has been documented and familial clustering is common with increased prevalence in institutions (Sgambato *et al.*, 2018). Most infections are acquired in early childhood with highest prevalence in Africa and Asia. Moreover, infected individuals develop antibodies against *H. pylori* which persist for up to 6 months after eradication. Low socioeconomic status, poor sanitation, poor personal hygiene, and absence of potable household water supply are prevalent in our environment and also linked with increased frequency of the disease with attendant health consequences (Emerenini *et al.*, 2021).

The outcome of *H. pylori* infection is diverse, though, persistent infection results in antral gastritis (inflammation of the stomach lining in the stomach's antral region). Infected individuals present with gastric reflux, abdominal pain, intestinal bleeding, occasional fevers and loss of weight which if not treated can result in gastric ulceration and perforation (Bordin *et al.*, 2018). Disease manifestation in childhood is commonly asymptomatic and usually apparent on upper gastrointestinal endoscopy. Moreso, *H. pylori* infection is related to peptic ulcer disease (Crowley *et al.*, 2016) and should be eradicated when detected in such setting. Possible causal links have also been made with iron deficiency anaemia (low serum ferritin and haemoglobin levels), short stature, atopy, and idiopathic thrombocytopenia (ITP) among others (Medzhitov *et al.*, 2007). Evidence also suggests that *H. pylori* can suppress the gastric acid barrier, allowing ingested entero-pathogens in weaning foods to gain access into the small intestine. This predisposes to childhood diarrhoea, malabsorption of essential nutrients such as vitamins B12 and C as well as growth failure (Gide *et al.*, 2019). Furthermore, the prevalence of this infection is difficult to accurately assess based on the common lack of symptoms in small age groups. Thus, only 5% of the infected children develop gastritis, ulcer disease or other *Helicobacter pylori*-related gastrointestinal disorders such as extra-intestinal

disorders, including growth disorders, iron refractory iron deficiency anemia, or thrombocytopenia (Poddar, 2019).

Although, Africa has the highest prevalence of *H. pylori* infections in the world (Stella *et al.*, 2019), there is paucity of data on *H. pylori* prevalence in the general population across different regions of Africa including Nigeria. *H. pylori* is reported to infect over 50% of the world population, and its distribution is influenced by factors such as age, gender, geographical location, ethnicity, and socio-economic factors, with higher prevalence in the developing countries compared to the developed countries especially in younger age groups (Okoroiwu *et al.*, 2021).

In Nigeria, Aje *et al.*, 2010 reported a 67.4% prevalence of *H. pylori* among dyspeptic patients in the southwest region of the country, Gide *et al.*, 2019 reported 51.95% prevalence among patients with dyspeptic symptoms in Damaturu metropolitan, Yobe State as Jemilohun *et al.*, 2010 reported 63.5% prevalence in patients with gastritis in Ibadan, while, Olokoba *et al.*, 2013, had prevalence rates of 93.6% by serology and 80.0% by histology among Nigerians with dyspepsia. The overall prevalence rate of *H. pylori* infection strongly correlated with low socioeconomic status, low living standards, poor personal and environmental hygiene, presence of *H. pylori*-positive family members and increasing age (Pounder *et al.*, 1995). Still in Nigeria, various studies on *H. pylori* showed prevalence rates between 73.0% and 94.5% among patients with dyspepsia (Otegbayo *et al.*, 2004).

*Helicobacter pylori* is one of the major causes of Ulcer, both, among symptomatic and asymptomatic individuals, moreover, a major etiologic factor in the pathogenesis of chronic gastritis, peptic ulcer disease, gastric adenocarcinoma and mucosa associated lymphoid tissue lymphoma. Despite all these known pathologies associated with *H. pylori*, the prevalence and associated risk factors of *H. pylori* among the residents of Abuja Municipal Area Council has not been extensively studied, and understanding the prevalence and associated risk factors of this infection among the residents is crucial. Therefore, this study aimed at the prevalence and associated risk factors of *H. pylori*

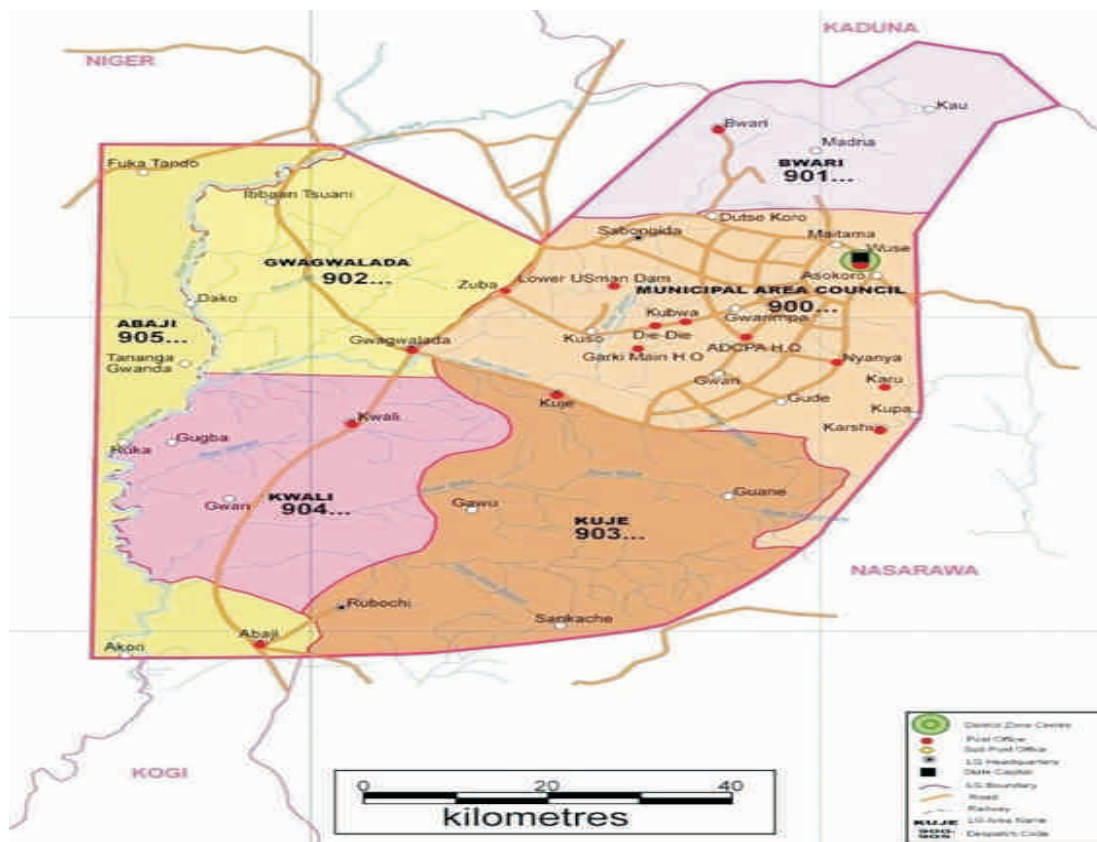
among the residents of Abuja Municipal Area Council, FCT, Abuja, in order to create more awareness, provide evidence base-line data and proffer solution that will go a long way in reducing the scourge.

**Materials and Method**

**Study Design:** A cross-sectional descriptive study design was employed, utilizing both quantitative and qualitative data collection methods.

**Study Area:** Abuja Municipal Area Council is the

study area; this council is one of the six area councils in Federal Capital Territory Abuja. The Federal Capital Territory which serves as the nation's capital, was created in 1976 and is located between latitude 9°4'N and longitude 7°29'E The FCT is located north of the confluence of the river Niger and river Benue. It is bordered by the states of Niger to the west and north, Kaduna to the northeast, Nasarawa to the east and south and Kogi to the southwest. The Federal Capital Territory consists of six area councils namely: Abaji, Abuja Municipal, Bwari, Gwagwalada, Kwali and Kuje Area Councils.



**Study population:** This comprised of all the residents of Abuja Municipal Area Council (AMAC), Abuja and included those with symptomatic and asymptomatic individuals.

**Ethical consideration:** The ethical clearance for the study was obtained from both Ethical Committee of National Open University of Nigeria and Federal Capital Administration. The following ethical procedures were put into consideration; Participants were fully informed about the study objectives, procedures and potential risks, ensuring their voluntary participation. All collected data was treated with strict confidentiality, ensuring the

privacy of participants and the study protocol was strictly followed.

**Sample Size Determination:** A suitable sample size of 422 (four hundred and twenty-two) was chosen using the formula:  $n = (Z^2 \times P \times (1 - P)) / d^2$  according to Naing *et al.* (2006).

Where:

- n: Required sample size
- Z: 1.96 (Statistical standard)
- P: 50.0% (assumed prevalence of *Helicobacter pylori*, because there was no reliable one in place (0.5))
- d: Margin of error of 5% (0.05)

$$\begin{aligned} \text{Thus } n &= (Z^2 \times P \times (1 - P)) / d^2 \\ &= 1.96^2 \times 0.5(1-0.5)/0.05^2 \\ &= 3.8416 \times 0.25/0.0025 \\ &= 384 + 10\% \text{ attrition} = 384 + 38 = 422 \end{aligned}$$

**Sampling Technique:** A random sampling technique was employed. The residents of AMAC were divided into demographic groups (age, gender, socioeconomic status). Random individuals were selected to participate in the study.

**Instrument of Data Collection:** The following were the instrument of data collection used:

1. **Questionnaires:** An adapted structured questionnaire was used to collect data on various risk factors associated with *Helicobacter pylori* transmission. The questionnaire included questions on socioeconomic status, sanitary patterns, living conditions, awareness and education about *Helicobacter pylori* and access to healthcare facilities.
2. **Laboratory analysis:** Stool samples

collected from participants were analyzed in the laboratory using enzyme immunoassay method to confirm the presence of *H. pylori*.

**Method of Data Collection**

- i. **Quantitative data:** A structured questionnaires were administered to participants to collect information on demographics, social-economic factors, dietary habits, lifestyle factors and medical history, which they filled and returned, while, submitting their stool samples.
- ii. Laboratory test results.

**Method of Data Analysis:**

The data collected was analyzed using Statistical Package for Social Sciences (SPSS version 25.0) to determine the prevalence of *Helicobacter pylori* infection and identify significant risk factors associated with the infection.

**Results**

**Table 1: Socio-Demographic Data of the study population**

VARIABLE	NO SCREENED (%)
<b>Age group (years)</b>	
5-10	10 (2.4)
11-20	44 (10.4)
21-30	92 (21.8)
31-40	123 (29.1)
41-50	75 (17.8)
51-60	37 (8.8)
61-70	41 (9.7)
<b>Gender</b>	
Male	169 (40.0)
Female	253 (60.0)
<b>Educational status</b>	
Formal education	340 (80.6)
Informal education	82 (19.4)
<b>Occupational status</b>	
Unemployed	122 (28.9)
Employed	300 (71.1)

Table 1 shows the distribution of demographic data of prevalence of *Helicobacter pylori*. A total of 422 participants were tested in this study. Male participants were 47.0%, while 53.0% were female. The age range of participants were 5-70 years with the age range of 31-40 years being the predominant participants and 5-10 years being the least. 80.6% had formal education, while 19.4% had no formal education. The occupational status of participants were 28.9% unemployed and 71.1% were employed.

**Table 2: Overall prevalence of *Helicobacter pylori* infection among the residents of AMAC, FCT, Abuja.**

Number Screened	Number Positive (%)	Number Negative (%)
422	214(50.7)	208 (49.3)

Table 2 shows that out of 422 residents of AMAC, FCT, Abuja, screened for *Helicobacter pylori*, 214 (50.7%) of them were infected with *H. pylori*, while 208 (49.3%) of them were negative for the infection.

**Table 3: Gender Related Prevalence of *Helicobacter pylori* infection among the residents of AMAC, FCT, Abuja.**

Gender	Number Screened	Number Positive (%)	Number Negative (%)	OR	X <sup>2</sup>	P-value
Male	169	80 (47.0)	89 (53.0)	2.06	2.02	0.155
Female	253	134 (53.0)	119 (47.0)			

Table 3 shows that out 169 males screened, 80(47.0%) were positive for *H. pylori* infection, while 134(53.0%) of the female counterparts out of 253 females had it.

**Table 4: Age Related Prevalence of *Helicobacter pylori* infection among Resident of AMAC, FCT, Abuja.**

Age Group	Number Screened	Positive Number (%)	Number Negative (%)	X <sup>2</sup>	P-value
5-10	10	2 (20.0)	8 (80.0)	17.19	0.009
11-20	44	20 (45.5)	24 (54.5)		
21-30	92	50 (54.3)	42 (45.7)		
31-40	123	72 (58.5)	51 (41.5)		
41-50	75	43 (57.3)	32 (42.7)		
51-60	37	15 (42.5)	22 (59.5)		
61-70	41	12 (29.3)	29 (70.7)		

X<sup>2</sup>=17.19; P=0.009

Table 4 shows that 31-40 years age cohort were mostly infected with 58.5% rate, followed by 41-50 years, while 5-10 years had the lowest rate of 20.0%.

**Table 5: Associated Risk Factors of *Helicobacter pylori* infection among residents of AMAC, FCT, Abuja.**

Variables	No. Screened	<u><i>H. pylori</i></u>		X <sup>2</sup>	p-value
		Positive (%)	Negative (%)		
<b>Age group (years)</b>					
5-10	10	2 (20.0)	8 (80.0)	17.9	0.009*
11-20	44	20 (45.5)	24 (54.5)		
21-30	92	50 (54.3)	42 (45.7)		
31-40	123	72 (58.5)	51 (41.5)		
41-50	75	43 (57.3)	32 (42.7)		
51-60	37	15 (40.5)	22 (59.5)		
61-70	41	12 (29.3)	29 (70.7)		
<b>Gender</b>					
Male	169	80 (47.3)	89 (52.7)	2.02	0.155
Female	253	134 (53.0)	119 (47.0)		
<b>Educational status</b>					
Formal	340	157 (46.2)	183 (53.8)	43.18	0.001*
Informal	82	57 (69.5)	25 (30.5)		
<b>Occupational status</b>					
Employed	300	132 (44.0)	168 (56.0)	22.76	0.001*
Unemployed	122	82 (67.2)	40 (32.8)		
<b>Drinking pipe borne water/Sources of water</b>					
Yes	367	194 (52.9)	173 (47.1)	6.51	0.001*
No	55	20 (36.4)	35 (63.6)		
<b>Living in crowded room</b>					
Yes	10	8 (80.0)	2 (20.0)	3.33	0.011*
No	412	206 (50.0)	206 (50.0)		
<b>Washing hands before meal</b>					
Yes	415	209 (50.4)	206 (49.6)	2.14	0.143
No	5	2 (40.0)	3 (60.0)		
<b>Smoking</b>					
Yes	26	10 (38.5)	16 (61.5)	0.99	0.320
No	396	204 (51.5)	192 (48.5)		

<b>Consume food from vendor</b>					
Yes	299	137 (45.8)	162 (54.2)	11.71	0.001*
No	123	77 (62.6)	46 (37.4)		
<b>Family history</b>					
Yes	187	100 (53.5)	87 (46.5)	1.00	0.317
No	235	114 (48.5)	121 (51.5)		
<b>Frequent use of NSAIDs</b>					
Yes	159	68 (42.8)	91 (57.2)	6.37	0.012*
No	263	146 (55.5)	117 (44.5)		
<b>Eating raw vegetable and unwashed fruits</b>					
Yes	60	39 (65.0)	21 (35.0)	4.43	0.035*
No	362	175 (48.3)	187 (51.7)		
<b>Experience gastric related symptoms</b>					
Yes	299	164 (54.8)	135 (45.2)	8.32	0.008*
No	123	50 (40.7)	73 (59.3)		

\*Significant at  $p < 0.05$

Table 5 shows that Age group ( $p = 0.009$ ), Educational status ( $p = 0.001$ ), Occupational status ( $p = 0.001$ ), Drinking of pipe borne water/sources of water ( $p = 0.001$ ), Living in crowded room ( $p = 0.011$ ), Consumed food from food vendor ( $p = 0.001$ ), Frequent use of NSAIDs ( $p = 0.012$ ), Eating raw vegetables and unwashed fruits ( $p = 0.035$ ), and Experienced gastric related symptoms ( $0.008$ ) were the associated risk factors of *Helicobacter pylori* among the study population.

### Discussion

*Helicobacter pylori* (*H. pylori*) infection worldwide is a huge challenge, particularly to African countries and is of great public health importance due to its associated serious health issues of duodenal and gastric ulcer, chronic gastritis, gastric cancer and extra-gastric diseases. The infection presently affects approximately one half of the world population (Luigi, 2018) and if left untreated it can lead to damage of the tissues in the stomach and the first part of small intestine (the duodenum). This can cause pain and inflammation, in some cases, it can also cause painful sores called peptic ulcers including gastric ulcers in upper digestive tract. In this cross-sectional descriptive study of the prevalence of *Helicobacter pylori* and associated risk factors among residents of Abuja Municipal Area Council

(AMAC), FCT, the result has shown an overall prevalence of 50.7% infection among the residents, and this constitutes a major public health threat to the inhabitants of AMAC and evidence that this infection is endemic in the area council. This may be attributed to a number of factors such as lifestyle and level of hygiene of the residents as well as living conditions, living without a reliable supply of clean water and social-economic status of the residents (Kallirroï *et al.*, 2019).

In Nigeria, the prevalence of *Helicobacter pylori* is high with an estimated 87.7% prevalence rate, most infected individuals (>80%) have asymptomatic gastritis and only a minority eventually develop Peptic Ulcer Disease (PUD) or gastric malignancies (Smith *et al.*, 2019).

The prevalence of *H. pylori* in this study is not consistent with reports of previous studies across Nigeria as they reported high values and prevalence. For instance, Aje et al., 2010 and Jemilohun *et al.* (2010) reported *H. pylori* prevalence rates of 67.4% and 63.5% respectively, in southwest Nigeria, Olokoba *et al.* (2013) had 93.6% prevalence by serology and 80.0% by histology among Nigerians with dyspepsia in northcentral Nigeria. Moreso, Smith *et al.* (2019), revealed 68.4% among patients with type 2-diabetes mellitus in south south and south-west Nigeria, while Bello *et al.* (2018) reported 81.7% rate amongst subjects with low socio-economic status in north-west Nigeria. For other African countries, Laure *et al.* (2017) showed 64.39% rate in Cameroun, as Walker *et al.* (2014) reported 75.0% in Rwanda, while, Kimang'a *et al.* (2010) in Kenya had 73.3% in children and 54.8% in adults among patients who presented with dyspepsia. Elsewhere, Rahul *et al.* (2013) reported 51.0% in Pune, Marashtra, India. The wide range reported in the different studies including ours, may partly be due to differences in the method used for *H. pylori* detection, geographical locations, which could reflect environmental and personal hygiene levels, ethnicity, socio-economic factors and age of participants studied (Hooi *et al.*, 2017; Laure *et al.*, 2018). However, the result of this study agrees with the global average prevalence rate of 50.0% and most African reviewed literatures (Adeniyi *et al.*, 2018), and Omosor *et al.* (2017) who revealed a 52.0% prevalence of helicobacter pylori. The result when compared with those of Kooffreh-Ada *et al.* (2019) with a prevalence rate of 42.1% and Ayodele *et al.* (2018) that had 19.6% prevalence of *Helicobacter pylori* among patient in Port Harcourt, it is high. Nevertheless, the prevalence is in agreement with reports on previous studies by Hooi *et al.* (2017) (50.0%), Gide *et al.* (2019) (51.9%) and Chukwuma *et al.* (2020) who revealed 51.4% prevalence in their study. Furthermore, Oti *et al.* (2017) in Keffi, Nasarawa State had a prevalence rate of 56.3% and found an association between *H. pylori* infection with gender, age and type of infection. Nevertheless, when compared with works of Okoroiwu *et al.* (2021) in Owerri on sero-prevalence and risk factors associated with *H. pylori* as well as that of Olokoba *et al.* (2013), Otegbayo *et al.* (2004), Kumurya, 2015 and Smith *et al.* (2019), who variously reported 71.1%, 93.6%, 73.0%, 96.0% and 87.7% respectively in their various studies, it is low. These may be due to differences in socio-economic and demographic status of the study population.

The relationship between the age of the study population and the prevalence of *H. pylori* is shown in table 4. There was a high burden of *Helicobacter pylori* especially among the agee-groups of 31-40 years (58.5%,  $X^2 = 17.9$ ,  $P=0.009$ ), while, 41-50 years cohort had an infection rate of 57.3%, as those in age brackets of 21-30, 11-20; 51-60; 61-70 and 5-10 years recorded 45.7%; 45.5%; 40.5%; 29.3% and 20.0% respectively, but the mean prevalence rate of 42.4% is still high indeed. Previous studies reported a relatively high prevalence of *Helicobacter pylori* infection among the older age population (Regev *et al.*, 1999). For instance, Okoroiwu *et al.* (2021), Gide *et al.* (2019) reported 51.9% prevalence of *Helicobacter pylori* infection in their studies with an infection rate of 69.23% and 61.79% respectively among the age-range of 50 and 59 years of age. Nevertheless, their works showed no significant statistical association between *H. pylori* and age. Moreover, Salles *et al.* (2002), reported high prevalence of *H. pylori* among middle age group, which is consistent with this study. The high prevalence of *H. pylori* among the middle age-groups in this study can be attributed to their lifestyles, hygienic behaviours and sanitary habits due to high rate of poverty. Studies have also shown that people whose ages are >60 years in the developing countries were more prone to severe disease conditions such as gastric cancer, peptic ulcer disease with significantly higher mortality (Franceschi, 2014). Furthermore, Kooffreh-Ada *et al.* (2019) reported a moderate (42.1%) prevalence of *Helicobacter pylori* infection within the age group of 40 to 60 years but its study showed no association of *Helicobacter pylori* infection with the gender of the patients.

On the gender-related prevalence of this study, females recorded more *Helicobacter pylori* infection (53.0%) than their male counterparts who had 47.0% infection rate, nonetheless, there was no statistically significant association between gender and *H. pylori* infection. This revelation was giving credence by previous Authors such as Adebaw *et al.* (2014) who reported a high prevalence in females than males. Moreover, Jadda *et al.* (2018) and Saidu *et al.* (2015) in supporting the report of this study, revealed high prevalence of *Helicobacter pylori* infection in females compared to males in their studies. However, Kaoru *et al.* (2017) and Valliani

*et al.* (2013) in disagreeing with the report of this work revealed higher prevalence in males than females. As Bello *et al.* (2018), found a male preponderance for *H. pylori* infection among their study participants. Moreover, findings of Smith *et al.* (2019), showed a slightly higher prevalence in male than female. The difference was however not statistically significant.

The analysis of associated risk factors of *Helicobacter pylori* infection among the study population showed that age ( $x^2 = 17.9$ ;  $p = 0.009$ ); Educational status ( $x^2 = 43.8$ ;  $p = 0.001$ ); Drinking pipe borne water/Sources of water ( $x^2 = 6.51$ ;  $p = 0.001$ ); Living in crowded rooms ( $x^2 = 3.33$ ;  $p = 0.011$ ); Experience of gastric symptoms ( $x^2 = 8.32$ ;  $p = 0.008$ ); Eating raw vegetables and unwashed fruits ( $x^2 = 4.43$ ;  $p = 0.035$ ); Frequent use of NSAIDs ( $x^2 = 6.37$ ;  $p = 0.012$ ) and Consuming of food from Vendors ( $x^2 = 11.71$ ;  $p = 0.001$ ) were the associated risk factors of *Helicobacter pylori* infection in the study area ( $p < 0.05$ ). This result has the support of earlier researchers, for instance, Pounder *et al.* (2015), Hooi *et al.* (2017), Goh *et al.* (2019) and Okoroiwu *et al.* (2021), all reported high prevalence of *H. pylori* among less-educated individuals. Bello *et al.* (2018) proposed that individuals from a lower socio-economic class were more likely to be linked with poor education, including poor health education and are more likely to be living in an environment that predisposes to contamination of food and water. However, in this present study, smoking ( $x^2 = 0.99$ ;  $p = 0.320$ ); Gender ( $x^2 = 2.02$ ;  $p = 0.155$ ), Washing hands before meal ( $x^2 = 2.14$ ;  $p = 0.143$ ) and Family history ( $x^2 = 1.00$ ;  $p = 0.317$ ) were not significantly associated with *H. pylori* infection. This did not corroborate with the work of Bello *et al.* (2018) who revealed significant association between Smoking and *H. pylori* infection.

### Conclusion

In conclusion, the prevalence of *Helicobacter pylori* infection in the study was 50.7% which is very significant and was found across the ages. Females were more infected than their male counterparts and age-group of 31-40 had the highest infection rate of 58.5%. Socio-economic factors such as educational status, occupational

status, living in crowded rooms, eating raw vegetables and unwashed fruits, those who experienced gastric related symptoms, were found to be significantly associated with *Helicobacter pylori* infection among the study populations. Hence, educational and enlightenment programs to create more awareness should be organized from time to time to enlighten the residents of the study in order to reduce ignorance, thereby reducing the rate of infection among the people.

### Consent for publication

All the authors have given consent for the publication of the manuscript under the Creative Commons Attribution-Non-Commercial 4.0 license. We otherwise convey all copyright ownership, including all rights incidentals thereto, exclusively to the Journal when published.

### Competing interest

The authors have no conflicts of interest to declare.

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### Authors' contribution

Conceptualization and design were by Okoroiwu, G.I.A and Toluhi Gbenga, Data was collected by Toluhi Gbenga, while, analysis was done by Okoroiwu, G.I.A. Both authors chose the materials and method used, the administration of the study was by both authors. All the authors contributed to the financing of the study. The software was obtained by Okoroiwu, G.I.A. The supervision was by all the authors. The validation process was by Okoroiwu, G.I.A and Toluhi Gbenga. The first draft was by Okoroiwu, G.I.A, while the task of reviewing and editing all the write-ups including final review before submission for publication were done by both authors.

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