

Seroprevalence and Risk Factors of Helicobacter Pylori Infection Among Children in South-East Nigeria

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ABSTRACT

BACKGROUND: *Helicobacter pylori* is a common cause of infection among humans. The organism is usually acquired in childhood but may persist into adulthood resulting in chronic gastritis, peptic ulcer disease and adenocarcinoma.

AIM: To determine the seroprevalence and risk factors of *H. pylori* infection among children seen at the Paediatric Out-Patient Clinic of a tertiary teaching hospital in South-East, Nigeria.

METHODS: It was a cross-sectional study carried out among 248 children aged between 1 and 18 years seen at the Paediatric Outpatient Clinic at the tertiary hospital from August 2017 to October 2017. Information on socio-demographics, feeding practices, daycare attendance and vaccination were obtained and entered into a proforma. The serum obtained from the patient was tested for *H. pylori* antibodies.

RESULTS: The seroprevalence of *H. pylori* infection among the

subjects was 36.3%. Statistically significant association was found between age of the subjects, parental education, social class, ingestion of uncooked/ raw food materials and *H. pylori* infection ($p < 0.05$). On logistic regression analysis, predictors of *H. pylori* infection were age 6-12 years (AOR = 2.42, 95% CI = 1.31-4.47, $p = 0.005$) and ingestion of uncooked/raw food materials (AOR= 2.38, 95% CI 1.14-8.33, $p = 0.022$).

CONCLUSION: Risk factors associated with *H. pylori* infection include age, parental education, social class and ingestion of uncooked or raw food materials.

Key words: Seroprevalence, Helicobacter pylori; Infection

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INTRODUCTION

The discovery of *Helicobacter pylori* (*H. pylori*) as a causative agent of chronic gastritis and peptic ulcer disease has revolutionized the management of these conditions. In 1983, two scientists, Robin Warren and Barry Marshall in Perth, Western Australia, reported that a 'curved bacilli' was found in the mucosal layer of a gastric biopsy specimen^[1]. They were able to identify the presence of this organism in biopsy specimens of 58 out of 100 patients who underwent gastroscopy^[2]. *Helicobacter pylori* was found in biopsy specimens of most of the patients with chronic gastritis, duodenal ulcer or gastric ulcer, suggesting that this organism may have a role in the causation of these disease conditions. *H. pylori* is a gram-negative spiral-shaped bacillus. The organism is known to cause infection in humans worldwide^[3]. The prevalence of *H. pylori* infection is about 50% globally^[4]. The prevalence varies in relation to geographical location, ethnicity, age and socioeconomic status of the population, being higher developing countries than in the developed ones^[4]. The organism has been classified as a group 1 carcinogen by World Health

Organization International Agency for Research on Cancer(IARC) [5], underscoring its importance in the aetiology of gastric adenocarcinoma. More than a half of the world’s population is infected with *H. pylori*, with majority of people acquiring it at a young age^[4,6,7]. The incidence is 3-10% of the population each year in developing countries compared with 0.5% in developed countries^[8]. Studies^[9,10] done in Nigeria found low socio-economic class as a major risk factor for *H. pylori* infection. The seroprevalence and risk factors for *H. pylori* infection is not known among children in the study area. Therefore the study was carried out to determine the seroprevalence and risk factors of *H. pylori* infection among children seen at the Paediatric Out-Patient Clinic of a tertiary health facility in South- East Nigeria.

Subjects, materials and methods

The study population comprised children aged 1 to 18 years presenting at the Paediatric Out-Patient Clinic of a tertiary teaching hospital in South- East Nigeria. It was a cross-sectional study carried out among 248 children aged between 1 and 18 years from August 2017 to October 2017. Information on socio-demographic characteristics, feeding practices, daycare attendance and vaccination were obtained and entered into a proforma. The children were classified into socioeconomic classes based on their parental/guardian socioeconomic classes according to scoring system for allocation into social classes by Olusanya *et al*^[11].

Ethical approval was obtained from the Research and Ethics Committee of the institution.

Two milliliters (2) ml blood sample was collected and the serum obtained was tested for *Helicobacter pylori* antibodies (IgG) using Acumen[®] rapid *H. pylori* test kit. Data was analyzed using SPSS Version 22. Frequency and proportions were used to describe categorical variables like age group, parental education, social class. While, means and standard deviation were used to describe continuous variables like weight, height and temperature. Associations between categorical variables and *H. pylori* was determined using the Chi square test. While association between continuous variables like weight and *H. pylori* infection was determined using the T test. Predictors of *H. pylori* infection were determined using logistic regression. A p-value of <0.05 was considered statistically significant.

RESULT

The demographic characteristics of the subjects are presented in Table 1. One hundred and fourteen subjects (46.0%) were aged between 6 and 12 years.

Table 2 shows the feeding practices, vaccination and day care attendance of the subjects. In 37 (14.9%) subjects, mothers had practiced chewing of food before giving the children to ingest.

The result of *H. pylori* antibody testing among the subjects is shown in Table 3. Ninety (36.3%) out of 248 subjects tested positive.

The relationship between demographic characteristics and *H. Pylori* serology is shown in Table 4. Seropositivity was highest in the age group 6-12 years (44.7%) compared to the other age groups (*p* = 0.005). The proportion of subjects who tested positive was highest (47.2%) in the lower social class (*p* = 0.043).

The relationship between feeding practices, vaccination and day care attendance of the subjects is shown in Table 5. A higher proportion (57.5%) of subjects who ate uncooked / raw food materials tested positive for *H. pylori* (*p* = 0.002).

Logistic regression output of *H. pylori* infection on selected variables is shown in Table 6. Adjusted odds ratio (AOR) showed

Table 1 Demographic characteristics of the subject.

Demographic Characteristics	Freq (n = 248)	Per(%)
Age (yrs)		
1-5	102	41.1
6-12	114	46
13-18	32	12.9
Gender		
Male	138	55.6
Female	110	44.4
Location		
Rural	33	13.3
Urban	215	86.7
Father’s Education		
None	1	0.4
Primary	24	9.7
Secondary	65	26.2
Tertiary	158	63.7
Mother’s Education		
None	4	1.6
Primary	20	8.1
Secondary	68	27.4
Tertiary	156	62.9
Social Class of Parents		
Lower	36	14.5
Middle	113	45.6
Upper	99	39.9

Table 2 Feeding practices, vaccination and day care attendance of the subjects

	Frequency (n = 248)	Percentage (%)
Chewing food by the mother before giving the child		
Yes	37	14.9
No	211	85.1
Exclusive breastfeeding		
Yes	130	52.4
No	118	47.6
Ingestion of uncooked/ raw food materials		
Yes	40	16.1
No	208	83.9
Vaccination complete for age		
Yes	242	97.6
No	6	2.4
Day care attendance		
Yes	72	29
No	176	71

Table 3 Result of H. pylori serology test.

Result of H. pylori test	Frequency (n = 248)	Percentage (%)
Negative	158	63.70%
Positive	90	36.30%

that age and ingestion of uncooked/raw food materials were the significant predictors of *H. pylori* infection in this study. Subjects aged 6 to 12 years were twice at risk of having *H. pylori* infection compared to those aged 1-5 years (AOR = 2.42, 95%CI 1.31-4.47, *p* = 0.005). Also, subjects who ingested uncooked food materials were twice at risk of having *H. pylori* infection compared to those who did not (AOR = 2.38; 95% CI 1.14-8.33; *p* = 0.022).

Table 4 Relationship between demographic characteristics and H. Pylori serology.

Demographic Characteristics	Negative [n = 158 (%)]	Positive [n = 90 (%)]	Total (%)	χ^2	P-value
Age Group					
1-5 (ref)					
6-12	63 (55.3)	51 (44.7)	114 (100)		
13-18	18 (56.2)	14 (43.8)	32 (100)		
Gender					
Female	83 (60.1)	55 (39.9)	138 (100)	1.71	0.191
Male	75 (68.2)	35 (31.8)	110 (100)		
Location					
Rural	21 (63.6)	12 (36.4)	33 (100)	0	0.992
Urban	137 (63.7)	78 (36.3)	215 (100)		
Father's education					
None	0 (0.0)	1 (100)	1 (100)	14.263*	0.001
Primary	15 (62.5)	9 (37.5)	24 (100)		
Secondary	30 (46.2)	35 (53.8)	65 (100)		
Tertiary	113 (71.5)	45 (28.5)	158 (100)		
Mother's education					
None	2 (50.0%)	2 (50.0)	4 (100)	7.571*	0.046
Primary	12 (60.0%)	8 (40.0)	20 (100)		
Secondary	35 (51.5%)	33 (48.5)	68 (100)		
Tertiary	109 (69.9)	47 (30.1)	156 (100)		
Social class					
Lower (ref)					
Middle				6.297	0.043
Upper	67 (59.3)	46 (40.7)	113 (100)		
Upper	72 (72.7)	27 (27.3)	99 (100)		

*Fischers exact test.

Table 5 Relationship between feeding practices, vaccination, day care attendance and H. pylori serology.

	Negative [n = 158 (%)]	Positive [n = 90 (%)]	Total (%)	χ^2	P-value
Chewing of food by the mother before giving the child					
Yes	25 (67.6)	12 (32.4)	37 (100)	0.28	0.597
No	133 (63.0)	78 (37.0)	211 (100)		
Ingestion of uncooked/ raw food materials					
Yes	17 (42.5)	23 (57.5)	40 (100)	9.279	0.002
No	141 (67.8)	67 (32.2)	208 (100)		
Exclusive breastfeeding					
Yes	86 (66.2)	44 (33.8)	130 (100)	0.706	0.401
No	72 (61.0)	46 (39.0)	118 (100)		
Vaccination complete for age					
Yes	153 (63.2)	89 (36.8)	242 (100)	1.024	0.422
No	5 (83.3)	1 (16.7)	6 (100)		
Day care attendance					
Yes	48 (66.7)	24 (33.3)	72 (100)	0.384	0.536
No	110 (62.5)	66 (37.5)	176 (100)		

DISCUSSION

The seroprevalence of *H. pylori* in this study is 36.3%. This implies a high rate of infection among the children studied. This prevalence is higher than 30.9% reported by Etukudo et al^[10] in South-South, Nigeria, though lower than that reported by Remi et al^[12] and Senbanjo et al^[9] (72.3% and 63.6% respectively) among children in Lagos, Nigeria. A previous study carried out by Ugwuja and Ugwu^[13] in Abakaliki 10 years ago gave a prevalence of 11% among subjects less than 20 years, the study was done for only symptomatic patients who presented to the laboratory for evaluation for *H. pylori* infection. This may have accounted for the lower prevalence in that study. A lower prevalence of 1.8% was reported in a study among children conducted by Okuda et al^[14] in Japan, 16% among school children in Sweden by Tindberg et al^[15]. The lower prevalence seen in these countries compared to that in this study may be due to differences in standard of living and socioeconomic status which have been shown to be associated with *H. pylori* infection^[9].

Table 6 Logistic regression analysis of H. pylori infection on selected variables.

Selected variables	AOR (95% CI)	P-value
Age group		
1-5 (ref)		
6-12	2.42 (1.31-4.47)	0.005
13-18	1.93 (0.79-4.70)	0.148
Father's education		
None and Primary (ref)		
Secondary	2.19 (0.68-7.06)	0.189
Tertiary	0.93 (0.27-3.23)	0.907
Mother's education		
None and Primary (ref)		
Secondary	1.68 (0.36-7.78)	0.355
Tertiary	1.18 (0.21-6.78)	0.853
Social class		
Lower (ref)		
Middle	0.60 (0.15-2.45)	0.475
Upper	0.59 (0.12-2.87)	0.587
Ingestion of uncooked/ raw food materials		
No (ref)		
Yes	2.38 (1.14-8.33)	0.022

The age of the subjects was found to be statistically significantly associated with *H. pylori* seropositivity with the highest prevalence in children aged between 6-12 years. There was an increasing prevalence between children aged 1 to 5 years and those aged 6 to 12 years. Similar findings of increasing prevalence with age have been reported in children^[9,16,17]. The reason may be that school age children spend a considerable period of time in school and they carry out a lot of activities including playing with soil. If the school environment is not hygienic, this can predispose the children to acquisition of organisms like *H. pylori*. There is therefore need for school age children to be educated on good hygiene practices. There was no statistically significant association between gender and *H. pylori* infection in this study. This implies that gender may have no role to play in the acquisition of *H. pylori* infection in children. This is similar with findings by some authors^[16,18,19]. Awuku et al^[20] however reported a significant association between *H. pylori* infection and female gender.

The association between parental education and seropositivity of *H. pylori* was found to be statistically significant, with subjects whose parents had tertiary education at less risk of having *H. pylori* infection. This may be because with higher level of education the parents have a better knowledge of hygiene practices which will improve the overall health of the child. Also, with a higher educational level there is likelihood of a higher income which will translate into better living conditions. This finding is similar to that reported by Ertem et al^[21] who found that parental education was an important risk factor for *H. pylori* infection. A study by Agumon et al^[22] among children in Benin republic however did not find any association between educational level of the parents and *H. pylori* infection. The implication of this for clinical practice is that there may be more children with *H. pylori* infection among parents who are less educated compared with the highly educated ones. Socioeconomic class was found to be associated with *H. pylori* infection. An inverse relationship was noted between socioeconomic status and *H. pylori* seropositivity, children from low socio economic class were at higher risk of *H. pylori* infection. Some studies^[9,10,22,23] have also reported similar association between low socioeconomic class and *H. pylori*

infection. This may be because individuals with low socioeconomic status may have poor living conditions and poor hygiene practices which will predispose them to infections like *H. pylori*. Parente *et al*^[24] noted a higher prevalence of *H. pylori* infection among families of low socioeconomic class than the higher socioeconomic class in Teresina, North-Eastern Brazil despite residing in the same community. Goldman *et al*^[25] however did not find any association between socioeconomic class and *H. pylori* infection. The reason given by the authors was that most of the subjects studied belonged to a high socioeconomic class. Since socioeconomic status is a reflection of income and educational status, as a preventive measure, there is need for government at all levels to improve the general standard of living of the populace, create jobs to improve family income and ensure inclusive and equitable education for all in line with the 4th Sustainable Development Goal (SDG 4).

Ingestion of uncooked or raw food materials was found to be statistically significantly associated with *H. pylori* infection in this study. This may be so because some locally available delicacies such as “African salad” commonly eaten in this environment are prepared using raw vegetables which may be contaminated by *H. pylori* if not properly washed, since this bacteria has been reported to be present in raw vegetables^[26,27,28]. Similar finding was reported by Hopkins *et al*²⁹ in a study in Chile among individuals less than 35 years old. The authors found that *H. pylori* seropositivity correlated with consumption of uncooked vegetables. Zhang *et al*^[30] reported that ingestion of raw food was strongly associated with prevalence of *H. pylori* infection among children aged 3 to 18 years old in Wuwei city, Gansu Province, China. Therefore, to reduce the risk *H. pylori* infection among children, raw vegetables should be washed thoroughly before consumption.

The significant predictors of *H. pylori* infection in this study were the age 6-12 years and ingestion of raw food materials. This finding underscores the need for improvement in the school health program and good hygiene practices in handling of food products before consumption.

Conclusion: *H. pylori* infection is common in children. Risk factors associated with *H. pylori* infection include age, parental education, social class and ingestion of uncooked or raw food materials.

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