British Journal of Medicine & Medical Research
9(4): 1-7, 2015, Article no.BJMMR.15985
ISSN: 2231-0614

SCIENCEDOMAIN *international*
www.sciencedomain.org

Seroprevalence of *Helicobacter pylori* Infection among Asymptomatic Children in Lagos, Nigeria

Quadri Remi[1], F. O. Olufemi[2*], O. O. Odedara[1] and S. A. Bamiro[3]

[1]Department of Microbiology, College of Biological Sciences, Federal University of Agriculture, Abeokuta, Nigeria.
[2]Department of Veterinary Microbiology and Parasitology, College of Veterinary Medicine, Federal University of Agriculture, Nigeria.
[3]Department of Physiology, Faculty of Basic Medical Sciences, College of Medicine, Lagos State University, Lagos, Nigeria.

Authors' contributions

This work is carried out in collaboration between all authors. Authors FOO and OOO designed the study. While author FOO wrote the protocols and first draft of the manuscript, author QR is credited with most of the bench work. Author SAB processed the ethical protocols. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2015/15985
Editor(s):
(1) Syed Faisal Zaidi, Department of Basic Medical Sciences, College of Medicine, King Saud Bin Abdulaziz University-HS, National Guard Health Affairs, King Abdulaziz Medical City, Kingdom of Saudi Arabia.
(2) Fuhong SU, ICU Laboratory, Erasme Hospital, Free University Brussels, Brussels, Belgium.
Reviewers:
(1) Diana Tapia, National Autonomous University of Mexico, Mexico.
(2) Anonymous, Universidad Autonoma Meropolitana-Iztrapalapa, Mexico.
(3) Anonymous, Sapienza University, Italy.
(4) Yuqun Shan, Department of Microbiology, Shandong University, China.
Complete Peer review History: http://sciencedomain.org/review-history/9918

Original Research Article

Received 30th December 2014
Accepted 9th May 2015
Published 27th June 2015

ABSTRACT

Aim: *Helicobacter pylori* infection is mainly acquired during childhood and is strongly linked with peptic ulcer disease. This study determines the seroprevalence of *Helicobacter pylori* infection among school children in Lagos, Nigeria.
Place of Study: Alimosho and Ajeromi Local Government Areas of Lagos state, Nigeria between months March to September 2014.
Methodology: 195 asymptomatic children of aged 2-16 attending public health facility in selected Local Government in Lagos, Nigeria were recruited for the study with descriptive questionnaire. Blood samples of 5 ml were collected into plain bottle and sera obtained were analysed for *Helicobacter pylori* Immunoglobulin G using *DiaSpot H. pylori* kit.

**Corresponding author: Email: Olufemifo@funaab.edu.ng;*

Results: Of the 195 children examined for *H. pylori* IgG, 72.3% were seropositive while highest rate of 72.7% seroprevalence was recorded among children aged 5-7 years. Of seropositive observed among children aged 5-7 years, 37.5% and 62.5% were male and female respectively, while seropositive rate among children age 8-10 years, 51.3% were female and 48.7% male (p=0.055). Seroprevalence rate of 70.1% was observed among the children living in a house with population of 6 -7 people (p=0.076) while significant value of 69.1% and 76.6% were recorded among the children whose parents are traders and middle class employees respectively (p<0.05). Households with no regular potable water supply *(never)* have higher rate of 70.3% seroprevalence and 73.2% rate was observed among those that *sometimes* have water for their drinking and domestic use. Seropositive children of 72.5% *sometimes buy food* from elsewhere while only 73.2% seropositive *always buy food* from street vendors or other sources outside their home

Conclusion: It could be deduced that while *H. pylori* is acquired early in life, infection can be asymptomatic and poor standards of living and socioeconomic status can contribute to early infections.

Keywords: Seroprevalence; asymptomatic infection; children; Helicobacter pylori.

1. INTRODUCTION

Helicobacter pylori infection is typically acquired after birth in both developed and developing countries of the world [1]. Infection with the organism has been reported to follow a pattern associated with geographical and socio-demographic factors [2]. In contrast to developed countries, *Helicobacter pylori* infection in developing countries is high rising from 50% in children aged 5, to 90% by the time they attain adulthood [3,4]. Developed countries, with improved standard of living, high socioeconomic conditions and hygiene have records of lower rates of infection [5].

H. pylori has been known to penetrate gastro-intestinal mucosa and predispose infected children to childhood diarrhea, maladsorption of essential nutrients such as vitamins C and B12 [6,7]. Infection may therefore cause gastritis, peptic ulcers [8] and gastric carcinoma [9]. *H. pylori* infection may show lifelong persistence in the gastric mucosa [10]. The routes of transmission remain unclear making it difficult to implement public health measures to prevent infection [11]. However, person-to person transmission is usually mediated by breast-feeding, oral-to-oral, oral-fecal route, over-crowding and poor hygienic practices [12].

Studies have also listed lower socioeconomic status, older age, [13], overcrowding [14], gender, proximity with pets, and breast feeding [14,15] among risk factors for infection. Also, *H. pylori* had been isolated from the intestinal tract of dogs, cats and sheep [15]. Research has also demonstrated that *H. pylori* can live for several days in milk and water in its infectious bacillary form and in river water for several months in a non-culturable but viable form [16].

In developing countries *H. pylori* infection occurs at younger ages, frequently during infancy, and reaches a prevalence of 70% to 90% in some regions [3]. The incidence of *H. pylori* infection, determined indirectly, also suggests a rate several times higher than that in developed countries [17,18].

In Nigeria, several authors have associated *H. pylori* infection with clinical gastritis, peptic ulcers, recurrent abdominal pain [18,19], however there is a dearth of information on its infection among asymptomatic children, associated risk factors influencing the spread of *H. pylori* infection among apparently healthy children and adolescents. Earlier work cited on *H. pylori* infection among Nigerians recorded a very high prevalence of 85% among the general population [3], however a more recent work of Etukudo et al. [18] recorded a sero-prevalence of 40.70% among children with clinical symptoms in a hospital in the Southern part of the country.

Therefore, this study was conducted to determine the prevalence of Immunoglobulin G antibodies to *H. pylori* in apparently healthy young children living among the general population in Lagos, Nigeria. In addition, risk factors associated with infection and transmission were evaluated.

2. MATERIALS AND METHODS

Using a random stratified sampling method, informed consents were obtained from the parents of 195 apparently healthy school children

aged between 2 years and 16 years attending Crèche, Nursery, Primary and Secondary Schools and resident in the Alimosho and Ajeromi Local Government Areas of Lagos state. Questionnaires were given out to the children and or their parents while additional assent forms were issued to the adolescent children after they had been educated on the study. The sample size was determined using Hsieh et al. [20]. The questionnaires were designed to supply relevant demographic information on age, sex, household population (number of members of family that sleep in a room), household income, socio-economic class, maternal education level, availability of water in household and eating habits.

3.0 ml of venous blood was collected into plain tubes (Celtec, Germany) and allowed to clot by standing the samples at room temperature, 30ºC, for 10 minutes. Clear non-hemolyzed serum sample was obtained by spinning the tubes at 2000 rpm for 5 minutes using the table centrifuge (Boehringer, USA).

Each serum (about 400 µl/ sample) was transferred into a new tube and stored at 5ºC till use. The *DiaSpot H. pylori* kit (Indonesia) stored at 30ºC (room temperature) was used for the analysis according to the manufacturer's instruction *(One step H. pylori Test Device [Serum/ Plasma] Package*). The kit is a qualitative immunoassay membrane strip for the detection of *H. pylori* Immunoglobulin Gantibodies in serum. Briefly, 3.0 drops of serum sample were transferred to the specimen well of test device carefully, to avoid trapping air bubble in the specimen well. Appearance of a single red line indicates a negative result while double lines indicate positive sample.

2.1 Data Analysis

Significance of each variables obtained against the sero-positivity of the subjects was determined using Student *t*-test while chi-square was used to determine the significance of seropositive prevalence among the subjects at $P<0.05$.

3. RESULTS

Of the 195 children examined for *H. pylori* IgG, high rate 69.2% seropositive was recorded among the children ages 2 to 4 years while 72.7% sero-prevalence was recorded among children aged 5-7 years Table 1.

Highest rate of 62.5% seropositive was observed among the female aged 5-7 years and 48.7% male aged 8-10. Also, 51.6% and 48.6% seropositive rate was recorded among age female and male aged 8-10 respectively in Table 2.

Seroprevalence rate of 70.1% was observed among the children living in a house with population of 6 -7 people ($p=0.046$) which is considered as a norm in Nigerian households while significant value of 69.1% and 76.6% were recorded among the children whose parents are traders and middle class employee respectively ($p<0.05$).

Table 1. Seroprevalence of study population according to age group

Age group (years)	Seroprevalence of the subjects	
	Positive n/N (%)	Negative n/N (%)
2-4	18/26 (69.2)	8/26 (30.8)
5-7	40/55 (72.7)	15/55 (27.3)
8-10	39/51 (76.5)	12/51 (23.5)
11-13	31/43 (72.1)	12/43 (27.9)
14-16	13/20 (65.0)	7/20 (3.6)
Total	141/195 (72.3)	54/195 (27.7)

(N=total number of subjects tested, n=number of subjects tested positive, %=percentage of subject tested positive)

Table 5 shows the seropositivity of the subjects in relation to water availability. Households with no regular potable water supply *(never)* have higher rate of 78.6% seroprevalence and 73.2% rate was observed among those that *sometimes* have water for their drinking and domestic use.

It was observed that 72.5% seropositive children eat food *sometimes buy food* while only 73.2% seropositive *always buy food* from street vendors or other sources outside their home.

4. DISCUSSION

The seroprevalent rate of 72.3% recorded in this study is substantially higher than prevalence estimates reported in previous Nigerian studies. In 1993, Holcombe reported 69% prevalence rate among pediatric age group from the northern part of Nigeria [3], 11% rate among children who presented with dyspepsia in a tertiary health facility in Abakaliki in southeastern Nigeria [12], 14% seroprevalence was reported from southern Nigeria by Etukudo et al. [19] and recently 63.6% prevalence of asyptomatic *H. pylori* in apparently healthy children in Lagos, Nigeria [20]. This clearly shows that increasing rate of *H. pylori* infectivity among children suggests impending

epidemic infection that calls for immediate practical intervention.

This study shows that higher 55.6% of female children between 2-4 years are seropositive to *H. pylori.* At this age, most children attend Crèche, kindergarten, public play grounds and even parties with their parents. This exposure increases their chances of being infected with *H. pylori.* The risk of exposure increases until when they become 8 - 10 when 51.3% female children would have been infected and become carriers. Person-to-person as major routes of *H. pylori* infection may have contributed to this rate of infection.

Mothers that are traders and artisans have more unrestricted movements and less regulated interactions and therefore are more at risk of infections compared with parents that do more sedentary vocations. Therefore artisans and traders, by their vocation, make more contacts with people daily and hence have a higher chance of acquiring infections more readily, become carriers and subsequently transmit the organisms to their children.

Overcrowding increases the chance of seropositivity among the households [21]. This is because household members share eating utensils, live in poorly ventilated rooms and are more likely prone to poor hygiene. Hence in this study, households that have members of 4-5 are 73.8% seropositive and households with 6-7 members have even a lower rate of 70.1% sero-positivity, Table 3. Although the households with 2-3 members and 8 and above seem to have high sero-positivity. These households are not representative because they are not common in the study areas. This is because the areas studied are urban areas of Lagos which is densely populated with poor sanitary environment.

The socioeconomic status of parents seems to play an important role in this study. Prevalence of 80.0% in children from unemployed mothers followed by 69.1% in children from low income traders was recorded in contrast with higher rate of 76.6% from mothers with relatively high income (Elite class) Table 4. Thus standard of living may be contribute significantly to *H. pylori* infection.

Although breastfeeding was not a focus of this study, younger children in the families are sero-negative compared with their older siblings. This could be suggestive of the protective effects of residual maternal antibodies in relatively young children and infants. These findings confirm the study of Chak et al. [22], who reported breast-feeding being protective against *H. pylori* infection.

Households with regular supply of potable water would most likely have higher standard of personal and general hygienic practices. This is probably responsible for the observation in this study where families with regular water supply have low seropositivity of 78.6% compared lower rates of 73.2% and 70.3% in households that sometimes have water supply and those that do not have water respectively Table 5. Significantly higher comparative seropositivity was observed among males than females.

Comparing seropositivity in males and females across the age groups confirms a significant relationship with more males being seropositive than females. Although the reasons for this are yet to be understood, results similar to this study was published in 2012 by Etukudo et al. [18] in Southern Nigeria.

Moreover, there was no there was no significant relationship between the eating habits of children from families that buy food from outside and those that do not Table 6. This could pose a risk factor for *H. pylori* infection as a result of precarious hygiene standards, overcrowding, contaminated environment and water (23, 24). Also low socio-economic standard and living conditions are associated factors for *H. pylori* (25, 26, 27) among the studied groups.

Table 2. Distribution of children based on age and gender

Age distribution (years)	Seropositive rate among the subjects n (%) = 141 (72.3)		
	Males n (%)	Females n (%)	p value
2-4	8/18 (44.4)	10/18 (55.6)	0.896
5-7	15/40 (37.5)	25/40 (62.5)	0.051
8-10	19/39 (48.7)	20/39 (51.3)	0.055
11-13	15/31 (48.4)	16/31 (51.6)	0.076
14-16	9/13 (69.2)	4/13 (30.8)	0.061
Total	141 (72.3)	54 (27.7)	0.003

N = total number of seropositive subjects, n = number of subjects tested positive, % = percent of subject tested positive

Table 3. Relationship between household population and seropositivity

Household population	HPSAg seropositivity		p value
	Positive n (%)	Negative n (%)	
2- 3	8/9 (88.9)	1/9 (11.10.5)	0.052
4 -5	48/65 (73.8)	17/65 (26.2)	0.072
6 -7	68/97 (70.1)	29/97 (29.9)	0.046
8 and above	17/24 (70.8)	7 (29.2)	0.092
Total	141/195 (72.3)	54/195 (27.7)	0.003

Table 4. Seropositivity to *H. pylori* and occupation of mothers of the children

H. pylori IgG seropositivity	Occupational status of the mothers of the children recruited				p value
	Unemployed n/N (%)	Artisan n/N (%)	Trader n/N (%)	Elites / Middle class n/N (%)	
Positive	24/30 (80.0)	25/37 (67.6)	56/81 (69.1)	36/47 (76.6)	0.035
Negative	6/30 (20.0)	12/37 (32.4)	25/81 (30.9)	11/47 (23.4)	0.056

(N=number of subjects tested, n=number of subjects tested positive, %=percentage of subjects tested positive)

Table 5. Distribution of children based on availability of water in the household

Characteristics	Rate of *H. pylori* IgG in subjects		p value
	Positive n/N (%)	Negative n/N (%)	
Always	22/28 (78.6)	6/28 (21.4)	0.002
Sometimes	41 /56 (73.2)	15/56 (26.8)	0.003
Never	78/111 (70.3)	33/111 (29.7)	0.001

(N=number of subjects tested, n=number of subjects tested positive, %=percentage of subjects tested positive)

Table 6. Seropositivity with respect to eating habit

Eating habit	Rate of *H. pylori* IgG in subjects (n=195)		
	Positive n (%)	Negative n (%)	p value
Always buy food	52/71 (73.2)	19/71 (26.8)	0.084
Sometimes buy food	66/91 (72.5)	25/91 (27.5)	0.065
Seldom buy food	16/21 (76.2)	5/21 (23.8)	0.073
Never buy food	7/10 (70.0)	3/10 (30.0)	0.081

5. CONCLUSION

Increasing rate of IgG-*H. pylori* sero-infectivity among the asymptomatic children observed in this study suggest impending epidemic due to associated risk factors such as poor hygiene, socio-economic standards and contaminated environment. Therefore urgent practical intervention should be implemented with aggressive public health awareness to prevent unexpected paedriatic morbidity and mortality.

CONSENT

The authors declared that informed assents and consent were obtained personally from all individual subjects involved in this study and any interested subject that met the criteria of the study. They were informed of the benefit of the study and freedom to withdraw if they wish as non-invasive method of fecal collection was used.

ETHICAL APPROVAL

Informed assent of the parents were obtained before commencement of the study while the Ethical Approval was obtained from the Ethical Committee of Lagos State University, College of Medicine, Ikeja, Lagos, Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Perez-Perez GI, Rothenbacher D, Hermann Brenner H. Epidemiology of *Helicobacter pylori* infection. Helicobacter. 2004;9(Suppl 1):1-6.
2. Holcombe C. *Helicobacter pylori*: The African enigma. Gut. 1992;22:429-43.
3. Holcombe C, Tsimiri S, Eldridge J, Jones DM. Prevalence of antibody to *Helicobacter pylori* in children in northern Nigeria. Trans R Soc Trop Med Hyg. 1993; 87:19-21.
4. Rehnberg-Laiho L, Rautelin H, Koskela P, Sarna S, Pukkala E, Aromaa A, Knekt P, Kosunen TU. Decreasing prevalence of helicobacter antibodies in Finland, with reference to the decreasing incidence of gastric cancer. Epidemiol. Infect. 2001; 126:37–42.
5. Vitale G, Barbaro F, Ianiro G, Cesario V, Gasbarrini G, Franceschi F, Gasbarrini A. Nutritional aspects of *Helicobacter pylori* infection. Minerva Gastroenterol Dietol. 2011;57:369-377.
6. Epplein M, Signorello LB, Zheng W, Cai Q, Hargreaves MK, Michel A, Pawlita M, Fowke JH, Correa P, Blot WJ. *Helicobacter pylori* prevalence and circulating micronutrient levels in a low income United States Population. Cancer Prev Res (Phila). 2011;4:871-878
7. Barazandeh F, Yazdanbod A, Pourfarzi F, Derakhshan M, GhajariehSepanlou S, Malekzadeh R. Epidemiology of peptic ulcer disease: Endoscopic results of a systematic investigation in Iran. Middle East J Dig Dis. 2012;4:90-6.
8. Forman D, Newell DG, Fullerton F, Yarnell JWG, Stacey AR, Wald N, Sitas F. Association between infection with *Helicobacter pylori* and risk of gastric cancer: Evidence from a prospective investigation. Brit. Med. Jour. 1990;1:302 (6788):1302-1305.
9. Xia HH, Talley NJ. Natural acquisition and spontaneous elimination of *Helicobacter pylori* infection: Clinical implications. Am J Gastroenterol. 1997;92:1780-7.
10. Bellack NR, Koehoorn MW, Macnab YC, Morshed MG. A conceptual model of water's role as a reservoir in *Helicobacter pylori* transmission: A review of the evidence. Epidemiol. Infect. 2006;134: 439-449
11. Roma E, Panayiotou J, Pachoula J, Kafritsa Y, Constantinidou C, Mentis A, Syriopoulou V. Intra-familial spread of *Helicobacter pylori* infection in Greece. J Clin Gastroenterol. 2009;43:711-715.
12. Ugwuja EI, Ugwu NC. *Helicobacter pylori* in uninvestigated dyspepsia in primary cares in Abakaliki, Nigeria. Online J Health Allied Scs. 2007;1:4.
13. Khalifa MM, Sharaf RR, Aziz RK. *Helicobacter pylori*: A poor man's gut pathogen. Gut. 2010;2:23-12.
14. Rothenbacher D, Bode G, Brenner H. History of breastfeeding and *Helicobacter pylori* infection in pre-school children: results of a population-based study from Germany. Int J Epidemiol. 2002;31:632–7.
15. Dore MP, Sepulveda AR, El-Zimaity H, Yamaoka Y, Osato MS, Mototsugu K, Nieddu AM, Realdi G, Graham DY. Isolation of *Helicobacter pylori* from sheep-implications for transmission to humans. Am J Gastroenterol. 2001;96:1396-1401
16. Sasaki K, Tajiri Y, Sata M, Fujii Y, Matsubara F, Zhao M, Shimizu S, Toyonaga A, Tanikawa K. *Helicobacter pylori* in the natural environment. Scand J Infect Dis. 1991;31(3):275-9.
17. Bardhan B, Duan LP, Caspary WF, Lembcke B. Endoscopy is not a risk factor for *Helicobacter pylori* infection but medical practice is. Gastrointest Endosc. 1997; 46(4):305-10.
18. Etukudo OM, Ikpeme EE, Ekanem EE. Seroepidemiology of *Helicobacter pylori* infection among children seen in a tertiary hospital in Uyo, SouthEastern Nigeria. Pan Afri Med J. 2012;12:39.
19. Senbanjo IO, Oshikoya KA, Njokanma OF. *Helicobacter pylori* associated with breastfeeding, nutritional status and recurrent abdominal pain in healthy Nigerian children. J Infect Dev Ctries. 2014;8(4):448-453.
20. Hsieh FY, Daniel AB, Michael DL. Satistics in medicine. Statist. Med. 1998;17: 1623-1634.
21. Perry S, Sanchez M, Yang S, Haggerty T, Hurst P, Perez-Perez G, Julie P. Gastroenteritis and transmission of *Helicobacter pylori* infection in households. Emerging Infectious Diseases. 2006; 12(11).
22. Chak E, Rutherford GW, Steinmaus C. The role of breast-feeding in the prevention of *Helicobacter pylori* infection: A systematic review. Clinical Infectious Diseases. 2009;48:430–437.

23. Francisco JDS, Cor JFF, Gifone AR, Andereia MRO, Edilberto NM, Dulciene MMQ. Prevalence of *Helicobacter pylori* in a rural area of the state of Mato Grosso, Brasil. MemInst Oswaldo Cruz, Rio de Janeiro. 1998;93(2):171-174.
24. Dore MP, Sepulveda AR, El-Zimaity H, Yamaoka Y, Osato MS, Mototsugu K, Nieddu AM, Realdi G, Graham DY. Isolation of *Helicobacter pylori* from sheep-implications for transmission to humans. Am J Gastroenterol. 2001;96:1396-140
25. Muhsen KH, Athamna A, Athamna M, Spungin-Bialik A, Cohen Z. Prevalence and risk factors of *Helicobacter pylori* infection among healthy 3 to 5 year-old Israeli Arab children epidemiol. Infect. 2006;134:990-996.
26. Smith SI, Omonigbehin EA, Goodluck HA, Abdulkareem FB, Onyekwere CA, Agomo C, Ndububa DA, Fowora MA, Otegbayo JA, Contreras M, Haas R, Rieder G. Diagnostic methods for the detection of *Helicobacter pylori* in Nigeria. Tropical Gastroenterol. 2010;31:113-115.
27. Ejilude OA, Akinduti PA, Umaihon KO, Ogunbileje JO, Akinbo JA, Folarin BO, Mannie-Udoh MI. Seroprevalence of *Helicobacter pylori* IgG in patients with symptomatic peptic ulcer. Journal of Medical Laboratory Science. 2009;18(1): 29-33.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/9918