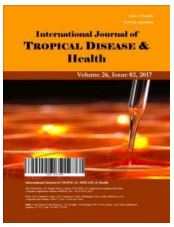

International Journal of TROPICAL DISEASE & Health

31(4): 1-7, 2018; Article no.IJTDH.42812
ISSN: 2278–1005, NLM ID: 101632866

The Influence of *Helicobacter pylori* Infection on Malaria Parasitaemia among Symptomatic Patients in Buea, Cameroon

Judith Lum Ndamukong-Nyanga[1*], Patakinzo Channe Guria[2], Ngum Catherine Ndamukong[2,3], Desdemona Njabi Nji[4] and Nyanga Bernard Yunga[5]

[1]Department of Biological Sciences, Higher Teachers Training College, University of Yaounde I, Cameroon.
[2]Department of Medical Laboratory Science, School of Health, Biaka University Institute of Buea, Cameroon.
[3]Department of Political Science, Faculty of Law and Political Science, University of Dschang, Cameroon.
[4]Department of Biochemistry and Molecular Biology, Faculty of Science, University of Buea, Cameroon.
[5]Department of Physics, Faculty of Science, University of Buea, Cameroon.

Authors' contributions

This work was carried out in collaboration between all authors. Author JLNN designed the study, wrote the protocol, supervised the Laboratory work, and wrote the first draft of the manuscript. Author PCG did the laboratory work and participated in writing the draft of the manuscript, Author NBY performed the statistical analysis. Author DNN participated in laboratory work and editing of the manuscript. Author NCN managed the literature searches and editing of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJTDH/2018/42812
Editor(s):
(1) Dr. Lim Boon Huat, Deputy Dean of Research, Postgraduate Studies and Networking School of Health Sciences, Health Campus, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia.
Reviewers:
(1) Emmanuel Ifeanyi Obeagu, Michael Okpara University of Agrriculture, Nigeria.
(2) Anjuwon, Tayo Micheal, Ahmadu Bello University, Nigeria.
(3) Gokben Ozbey, Firat University, Turkey.
(4) Martin Ekechukwu Ohanu, University of Nigeria, Nigeria.
Complete Peer review History: http://www.sciencedomain.org/review-history/25774

Original Research Article

Received 17th May 2018
Accepted 24th July 2018
Published 3rd August 2018

**Corresponding author: Email: ndamju@yahoo.com;*

ABSTRACT

Introduction: *Helicobacter pylori is* the main etiological factor for peptic ulcer disease and gastric malignancy. Malaria is one of the world's most prevalent vector-borne diseases and the leading cause of illness and death. While infection with either malaria or *H. pylori* can cause illness and death, infection with one can make an infection with the other worse and/or more difficult to treat.
Main Objective: The primary objective of the study was to determine the prevalence of malaria and malaria parasitaemia among symptomatic gastritis patients in Buea.
Method: The study was a cross-sectional study carried out from March 2017 to July 2017. The study population comprised of 150 patients who came to the hospital laboratory for *H. pylori* test requested by the physician. A structured questionnaire was used to get demographic and clinical data. Two ml of blood was collected from the patients into an EDTA tube using venipuncture technique. Few drops of blood were used to prepare a thick and thin blood film for malaria parasite determination, and the slides were allowed to air dry. The remaining blood in the EDTA tube was then centrifuged at 3000 rpm for 5minutes to obtain plasma. The *H. pylori* test strip was then removed from the pack and two drops of serum were placed on the sample region. The results were read after five minutes.
Results and Discussion: The general prevalence of malaria, *H. pylori* infection and the co-infection were 26.55, 21.9% and 9.9% respectively. There was a significant difference ($p < 0.05$) in the prevalence of *H. pylori* among the age groups, gender and educational level.

Keywords: Malaria; Helicobacter pylori; prevalence; co-infection; parasitaemia.

1. INTRODUCTION

Helicobacter pylori (H. pylori), a spiral-shaped pathogenic bacterium found on the human gastric mucosa, was first isolated by Warren and Marshall in 1982 [1,2]. The bacterium is a ubiquitous micro-organism, infecting half of the world's population and is widely accepted as the main etiological factor for peptic ulcer disease and gastric malignancy [3]. There has been growing interest in investigating the effects of *H. pylori* on extra-gastro duodenal diseases. Evidence for an association between *H. pylori* and anaemia has gained support from a range of epidemiological studies [4]. Moreover, improvement in iron deficiency anaemia (IDA) after *H. pylori* eradication has been demonstrated in children and adults with unexplained IDA [4]. One of the root causes of anaemia is malaria [5].

Malaria, sometimes called the “king of diseases”, is caused by protozoan parasites of the genus *Plasmodium*. It is one of the world’s most prevalent vector-borne disease and the leading cause of illness and death [5,6]. Nine out of ten of these deaths occur in Africa, and the rest occurs in Asia and Latin America. Globally, an estimated 3.2 billion people in 95 countries and territories are at risk of being infected with malaria and developing the disease, and 1.2 billion are at high risk [7].

Malaria and H. pylori overlap geographically, primarily in Sub-Saharan Africa, Southeast Asia and South America. While infection with either malaria or *H. pylori* can cause illness and death [6, 8], infection with one can make an infection with the other worse and/or more difficult to treat. There is unequivocal evidence that *H. pylori* can be considered as a health care issue because of the mortality associated with the infection, due to the risk of ulcer bleeding and gastric cancer [8]. Infection with *H. pylori* results in the development of gastritis in all infected humans, including children and adolescents [9,10]. Malaria and gastritis remain a major health problem in Africa.

Studies have shown that some malaria patients usually complain of epigastric pain [11] and this can be misleading as patients might turn to take self-medication for gastritis instead of going for malaria diagnosis and treatment. Information on the prevalence of malaria among patients presenting with signs and symptoms of gastritis in Cameroon and globally is limited. Thus, this research was designed to determine the prevalence of malaria and *H. pylori* among patients presenting with signs and symptoms of gastritis.

2. MATERIALS AND METHODS

2.1 Study Area

The study was carried out at the Buea Regional Hospital. Buea is the Regional Headquarter of

South West Region. The Buea Regional Hospital is the main referral hospital in Fako Division, South West Region of Cameroon. Patients presenting in this hospital come from all over the Fako Division. Buea is situated at the foot of Mount Cameroon. The climate of Buea is of the equatorial type with temperatures that range from 25-29°C annually. There are two main seasons; the rainy season and the dry season. Malaria is endemic in this region and transmission occurs all year round with an average of 1-80 malaria cases per thousand per year [7]. Generally, the volcanic activities of the mountain have rendered the topography of the entire region very rugged. Buea has a cool moist equatorial type climate.

2.2 Study Population, Duration and Design

It was a cross-sectional study carried out from March 2017 to July 2017. The study population comprised of all patients who came to the hospital laboratory for *H. pylori* test requested by the physician.

2.3 Sample Population, Sampling Technique and Data Collection

A total of 150 people were included in the study. Only patients that came for *H. pylori* test in the laboratory were accepted. Participants in the study were recruited and interviewed using a well-structured questionnaire and blood samples were collected for analysis.

A structured questionnaire was used to collect demographic and clinical data.

Each patient was invited for a talk on the aims and significance of the study after which an informed consent form was presented. Patients who consented to the study were then served questionnaires to help generated relevant demographic and clinical data.

2.4 Sample Collection and Test Procedure

Two ml of blood was collected from the patients into an EDTA tube using venipuncture technique. Few drops of blood were used to prepare a thick and thin blood film for malaria parasitaemia and the slides were allowed to air dry. The remaining blood in the EDTA tube was then centrifuged at 3000 rpm for 5 minutes to obtain plasma. The *Helicobacter pylori* test (Onsite Rapid Test, CTK Biotech) strip was then removed from the pack and two drops of serum were placed on the sample region and the results were read after five minutes. Where the test line and the control lines appeared, the test was recorded as positive, but where just the control line appeared, the test was recorded as negative. The malaria slide was stained using Giemsa and observed using the oil immersion objective (X100), at least 10 fields were observed and the malaria parasites counted against 200 WBC and expressed as parasites per microlitre of blood, assuming a WBC count of 8000 in one microlitre of blood [6].

2.5 Ethical and Administrative Consideration

Administrative and Ethical clearances were obtained from the Regional Delegation of Public Health in Buea and from the Director of the Buea Regional Hospital.

2.6 Data Analysis

All data were first recorded in a log book, then entered into Microsoft Excel and later exported to SPSS version 20.0 for analysis.

3. RESULTS

3.1 Distribution of Study Participants

For the study, 150 participants were recruited for the study and all (100%) gave their consent to participate in the study. From the study population, 69 (46%) were males while 81 (54%) were females. Eighty-six (57.3%) of the participants were single, 46 (30.7%) were married, 10 (6.7%) were divorced and 8 (5.3%) were widowed. 2 (1.3%) had no formal education, while 148 (98.7%) had some degree of formal education. Majority of the participants (39.3%) were in the age group 21-30 years as seen in Table 1.

3.2 General Prevalence of Malaria, *H. pylori* and Co-infection among Patients Presenting with Gastritis

From the study, 40 persons were positive for malaria giving an overall prevalence of 26.5% while 33 (21.9%) were positive for *H. pylori.* On the other hand, 15 persons were positive for malaria and *H. pylori* giving the prevalence of co-infection of 9.9% as seen in Fig. 1.

Table 1. Characteristics of the study population

Variables		Number enrolled	Percentage (%)
Age (years)	≤ 10	8	5.3
Mean age 28.33	11-20	28	18.5
	21-30	59	39.1
	31-40	30	19.9
	>40	25	16.6
Gender	Male	69	46.0
	Female	81	54.0

3.3 Prevalence of Malaria, *H. pylori* and Co-infection with Respect to Age Group

Chi-square analysis showed that there was a significant difference in the prevalence of *H. pylori* among different age groups with the highest prevalence in the age group >40 (12, 46.2**%**) and the lowest in the age group of ≤ 10 (1, 12.7**%**). There was no significant difference in malaria prevalence based on age groups. The prevalence of *H. pylori* and malaria co-infection was significantly highest in the elderly than in the younger population as shown in Table 2.

3.4 Prevalence of Malaria, *H. pylori* and Co-infection with Respect to Sex

According to the study, the prevalence of *H. pylori*, malaria and co-infection were higher among women than males. However, the chi-square test showed no statistically significant difference between the variables, as seen in Fig. 2.

3.5 Prevalence of Malaria, *H. pylori* and Co-infection with Respect to the Level of Income

From the study, *H. pylori*, malaria and co-infection was higher among participants with income level <25000 FRS. It was observed that there is statistical significance among participants positive for malaria (P= 0.001) *H. pylori* (P=0.000) and co-infection (P= 0.000) in relation to income (Table 3).

3.6 Prevalence of Malaria, *H. pylori* and Co-infection with Respect to the Level of Education

According to the study*, H. pylori* infection was higher among participants with at least a high school level of education (22, 29%). Malaria was higher among participants with primary education (7, 38.9%) and co-infection was observed among those with the vocational level of education 3 (16.7%). However, the chi-square test showed no significant difference between the variables, (Table 4).

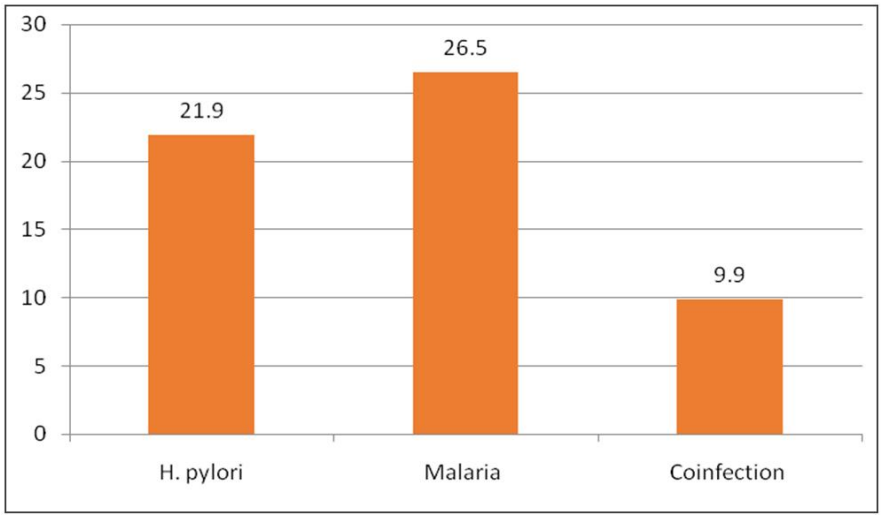

Fig. 1. Overall prevalence of malaria, *H. pylori* and co-infection

Table 2. Prevalence of Malaria, H. pylori and co-infection with respect to age group

Age(years)	Number enrolled	Positive for *H. pylori* (%)	P-value	Positive for malaria (%)	P-value	Co-infection	P-value
≤ 10	8	1(12.7)		3(37.5)		0(00)	
11-20	28	4(14.3)	0.011	10(35.7)	0.648	2(10.0)	0.037
21-30	59	8(13.6)		13(22.0)		5(9.8)	
31-40	30	8(26.7)		7(23.3)		2(8.0)	
>40	25	12(46.2)		7(26.9)		6(24.0)	

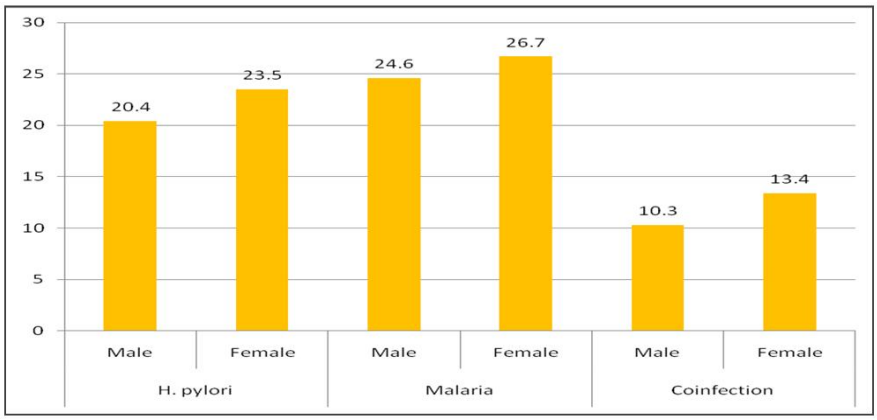

Fig. 2. Sex distribution of prevalence of Malaria, *H. pylori* and co-infection

3.7 Prevalence of Malaria, *H. pylori* and Co-infection with Respect to Marital Status

From the study, the prevalence of *H. pylori*, malaria and co-infection was high among widows 62.5%, 37.5%, and 28.6% respectively. However, Chi-square test showed no statistically significant difference between the various variables, (Table 5).

3.8 Prevalence of *H. pylori* with Respect to Parasite Density

From the study, *H. pylori* infection was higher among patients with low malaria parasite density 6 (40.0%) than among those with high malaria parasite density as seen on Table 6.

4. DISCUSSION

Based on the study, the general prevalence of malaria, *H. pylori* and co-infection of both diseases among patients presenting with gastritis was 26.5%, 21.9% and 9.9% respectively. The prevalence of *H. pylori* in this study was lower than that of Mabeku et al. (2018) [12] who reported a prevalence of 64.39% among patients in Douala, Littoral Region of Cameroon. It is also lower than that of a study carried out by Ankouane et al. (2015) [13] in Yaoundé who had a prevalence of 88.1%. This difference in prevalence is probably due to greater sensitization on health issues, risk and prevention over the past few years. Considering that Buea is principally an academic town and host students from different areas and countries, there is probably more sensitization on disease prevention.

H. pylori were more prevalent among patients >40 years of age, this could be due to the fact that they were advanced in age with weakened immune system. Also, elderly people have had more time to be exposed to the bacterium. Considering that infections with *H. pylori* are often asymptomatic, patients can carry infections for years before the appearance of clinical signs and symptoms. On the other hand, malaria was more prevalent among patients below the age of 10 years. This could also be due to the fact that their immune system was still developing and also that young children played outside and were exposed to mosquito bites which made them prone to malaria infection.

Table 3. Prevalence of Malaria, *H. pylori* and co-infection with respect to the level of income

Level of income	Number enrolled	Positive for *H. pylori* (%)	P-Value	Positive for malaria (%)	P-Value	Co-infection	P-Value
No income (unemployed)	23	35(13.7)		11(47.8)		2(14.3)	
<25000	34	18(54.5)	0.000	16(47.1)	0.001	12(40.0)	0.000
25000- 50 000	36	5(13.9)		7(19.4)		0(00)	
50 001- 75 000	30	3(10.0)		4(13.3)		1(3.7)	
75 001- 100 000	14	3(21.4)		2(14.3)		0(00)	
>100 000	13	1 (7.7)		0(00)		0(00)	

Table 4. Prevalence of Malaria, *H. pylori* and Co-infection with Respect to the Level of Education

Level of education	Number enrolled	Positive for *H. pylori* (%)	P-Value	Positive for malaria (%)	P-Value	Co-infection	P-Value
No formal education	2	0(00)		0 (00)		0(00)	
Primary	18	2(11.1)	0.256	7(38.9)	0.666	1(8.3)	0.803
Secondary	34	5(14.7)		8(23.5)		2(7.1)	
High school	75	22(29.0)		19(25.3)		9(13.8)	
Vocational	21	4(22)		6(28.6)		3(16.7)	

Table 5. Prevalence of Malaria, *H. pylori* and co-infection with respect to marital status

Marital status	Number enrolled	Positive for *H. pylori* (%)	P-Value	Positive for malaria (%)	P-Value	Co-infection(%)	P-Value
Single	86	14 (16.3)		23 (26.7)		7(10.0)	
Married	46	10 (21.7)	0.011	12(26.1)	0.870	5(12.8)	0.548
Divorced	10	4 (40.0)		2(20)		1(11.1)	
Widow/Widower	8	5 (62.5)		3(37.5)		2(28.6)	

Table 6. Prevalence of *H. pylori* with respect to malaria parasite density

Parasite density	Number enrolled	Positive for *H. pylori*	P-Value	Prevalence (%)
Low	15	6		40.0
Moderate	8	3	0.811	37.5
High	17	5		29.4

According to the study, females had a higher prevalence of malaria and *H. pylori* than their male counterparts. This could be due to the fact that women performed more work related to the environment and soil than men, like farm work and so may be more exposed to *H. pylori* bacterium.

Based on participants marital status it was observed that those who have lost their spouses had a high prevalence of *H. pylori* infection and malaria. This could be related to the fact that the loss of a spouse led to a drop in family income and as poverty could compromise such hygienic conditions and preventive methods.

This study also showed that *H. pylori* infection was more prevalent among patients with low malaria parasitaemia than those with high parasitaemia. This could be due to the fact that the presence of *H. pylori* in the body could stimulate the immune system to resist other pathogens thereby hindering their multiplication.

5. CONCLUSION

The general prevalence of malaria among asymptomatic gastritis patients was 26.5%. The general prevalence of *H. pylori* infection among asymptomatic gastritis patients was 21.9%. Co-infection with malaria and *H. pylori* was found to

be 9.9%. *Helicobacter* infection was higher among patients with low malaria parasitaemia than patients with high parasite load. Improved environmental and household hygiene can help to reduce the transmission of the malaria parasite and bacterial infection such as *H. pylori.*

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Marshall BJ, Goodwin CS. Revised nomenclature of *Campylobacter pylori.* Int J System Bacteriol. 1987;37:68.
2. Marshall BJ, Warren JR. Unidentified curved bacilli in the stomach of patients with gastritis and peptic ulceration. Lancet. 1984;8(1):1311-4.
3. Mitchell HM. The epidemiology of *Helicobacter pylori*. Curr Top Microbiol Immunol. 1999;241:11–30.
4. Choe YH, Kim SK, Hong YC. *Helicobacter pylori* infection with iron deficiency anaemia and subnormal growth at puberty. Arch Dis Child. 2000;82(2):136–40.
5. WHO. World malaria report; 2011. Available:http//www.who.int/malaria/publications/atoz/9789241564403/en/index.html (Accessed 7th June, 2017)
6. Ndamukong-Nyanga JL, Kimbi HK. Sumbele IUN, Nana Y, Bertek SC, Ndamukong KJN, Lehman LG. A Cross-Sectional study on the influence of Altitude and urbanization on the co-infection of malaria and Soil-transmitted helminthes in Fako Divisionm, south West Cameroon. International Journal of Tropical Diseases and Health. 2015;8(4): 150-164.
7. Malaria factsheet No 94". WHO (March 2014). Achived from the original on 3rd September 2014. Retrieved 28th August 2014. (Accessed: 6th June 2017)
8. Ernst PB, Gold BD. The disease spectrum of *Helicobacter pylori*: the immune-pathogenesis of gastroduodenal ulcer and gastric cancer. Annu Rev Microbiol. 2000;54:615–40.
9. Barabino A, Dufour C, Marino CE, Claudiani F, De Alessandria A. Unexplained refractory iron-deficiency anaemia associated with *Helicobacter pylori* gastric infection in children: Further clinical evidence. J Pediatr Gastroenterol Nutr. 1999;28(1):116–9.
10. Choe YH, Kim SK, Son BK, Lee DH, Hong YC, Pai SH. The randomized placebo-controlled trial of *Helicobacter pylori* eradication for iron-deficiency anaemia in preadolescent children and adolescents. Helicobacter. 1999;4(2):135–9.
11. World Health Organisation, WHO /UNICEF World Health Organisation. The African Malaria Report. Geneva. Resolution, Recommendations and Decisions. League of Red Cross and Red Crescent Society. Geneva. 2014;1-15
12. Mabeku LBK, Ndamga MLN and Leundji H. Potential risk factors and prevalence of *Helicobacter pylori* infection among adult patients with dyspepsia symptoms in Cameroon. BMC Infectious Diseases. 2018;18:278.
13. Ankouane F, Kozo M, Nonga BN, Vouffo F, Nzoumé JM, Njoya O, Ndam ECD. Historical types of gastric cancer and Helicobacter pylori infection in Yaounde Journal of Cancer Therapy. 2015;6:701-708.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/25774