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Original Research Article

The assessment of risk factors, lipid profile, uric acid and alanine aminotransferase in *Helicobacter pylori*-positive subjects

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ABSTRACT

Background: *Helicobacter pylori* infection is associated with gastro duodenal ulcer, chronic gastric, MALT lymphoma and gastric cancer but also to coronary heart diseases, ischemic diseases and metabolic diseases like diabetes. The colonization of the stomach by *H. pylori* causes persistent inflammation of the stomach wall which can influence some biochemical parameters in the patient. The aim of this study was to investigate risk factors, uric acid and alanine aminotransferase along with lipid parameters in *H. pylori*-positive and -negative patients at Dschang District Hospital in Cameroon.
Methods: A cross-sectional study was carried out on 160 consenting patients of average age 53.91±13.36 years attending the hospital for medical check-up or admitted in the hospital. The determination of anti-*H. pylori* IgG by the indirect enzyme-linked immunosorbent assay (ELISA) technique, enabled us to distinguish two groups of patients. A questionnaire survey was administered to study participants and potential risk factors for *H. pylori* exposure sought. Measurements of total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, uric acid and activity of alanine aminotransferase were carried out in serum by methods resulting from commercial kits.
Results: The habits of not washing hands after the toilets (OR = 3.33; p = 0.036) and giving of chewed food by the parents to children (OR = 2.26; p = 0.029) were independent risk factors of *H. pylori* infection. *H. pylori* infected patients had increased levels of uric acid (p = 0.017), total cholesterol (p = 0.001), LDL-cholesterol (p = 0.021) and total cholesterol/HDL-cholesterol ratio (p = 0.046) compared to the uninfected group.
Conclusions: Our study therefore suggests that *H. pylori* infection can cause modifications of lipid parameters and uremia that are considered as risk factors for cardiovascular diseases and gout.

Keywords: Alanine aminotransferase, *Helicobacter pylori* infection, Lipid profile, Risk factors, Uric acid

INTRODUCTION

Infectious pathologies are those caused by pathogenic micro-organisms such as viruses, parasites, mushrooms or bacteria.[1] Among these infections, those caused by *H. pylori* is most frequent and likely to reach all the population layers.[2] It is estimated that approximately half of the world population is infected by this bacterium with 70 to 90% of subjects affected at childhood and remain infected throughout their life in developing countries against 20 to 30% in industrialized countries.[2-4] The prevalence of *H. pylori* infection increases with age according to a regular rythm in the developed countries whereas in the developing countries, it settles quickly in children and affects almost all the population at adulthood.[5] In Africa, it is 58% before the age of one year and varies from 50 to 69% before the age of 10 years; at adulthood, the seroprevalences reach 90% to 100 %.[6] In

Cameroun, a study undertaken in 2013 in the town of Yaoundé estimated a global prevalence of *H. pylori* infection at 72.5% with 83.1%, 67.4% and 60.8% in the groups of age of less than 40 years, 40-50 years and greater than 50 years, respectively.[7] The transmission can be done by interpersonal contact of parents to the children within families and between couples, by oral-oral routes by means of saliva, gastric liquid contaminated at the moment of vomiting or of gastro-oesophagies reflux and by fecal-oral routes by intermediate of hands during diarrhea.[3,8-10]

Complications related to *H. pylori* infection are multiple and generally appear progressively. Thus, when a person is infected before the age of one year, the infection evolves to chronic gastritis (100%) between 20 to 30 years; infected patient can also have functional dyspepsia (5 to 10% of the cases), gastroduodenal ulcers (10%) or atrophic gastritis between 30 to 50 years; MALT lymphoma (0.3%) or gastric cancer (1 to 3%) which can be observed between 65 to 80 years.[11] Because of their high prevalence, and frequent need for healthcare which they generate, these diseases related to *H. pylori infection* constitute a significant public health problem.[2] Some associations between *H. pylori* infection and certain extradigestives diseases such as diabetes, coronary and ischaemic diseases were identified.[12] Hence, certain studies showed that *H. pylori* infection induces an increase in the concentrations of serum lipid parameters and which is inturn associated to an atherogenic lipidic profile.[13-15] However, there is no general consensus since other studies did not confirm these results.[16,17] It is at the look of these observations that arises the question to know what is the effect of *H. pylori infection* on the lipid profile, uric acid and the activity of alanine aminotransferase of patients coming for consultation at the District Hospital of Dschang.

Therefore, the aim of this study was to investigate risk factors, uric acid and alanine aminotransferase along with lipid parameters in *H. pylori*-positive and -negative patients at Dschang District Hospital in Cameroon.

METHODS

A cross sectional study was carried in the Laboratory of the District Hospital of Dschang from July 2016 to September 2016. Sera from 160 patients, of average age 53.91±13.36 years, 61 males and 99 females who agreed to take part in this study were used. The measurement of anti-*H. pylori* IgG was done by ELISA test using HpG screen kits which enabled us to distinguish two groups. 80 persons were selected as patients *H. pylori* infected group (HP+) and 80 persons who were negative by ELISA test were categorized as the control group (HP-). To minimize confounding factors, we excluded patients with pre-history of specific disorders like diabetes, renal failures, cirrhosis, cardiovascular diseases, respiratory deficiency, cancer and pregnant or women breastfeeding.

Collection of blood and biochemical analysis

Blood collection was specifically done by a qualified technician. The antecubical vein of the forearm was selected and disinfected with 70% alcohol cotton wool swab. Five millilitres of venous blood were collected into a dry tube pre-labelled with an anonymised patient codes. The blood sample was allowed to clot completely before centrifugation at 3000 rpm for 15 min to obtain serum. Serum was separated from the clot into tightly screwed microfuge tubes and stored at -20°C. These frozen sera were later analyzed for the biochemical parameters. Uric acid was measured in serum by the method described in DIALAB kit. Triglycerides, HDL cholesterol, total cholesterol and ALAT were all measured in serum by using the methods described in INMESCO commercial kits (INMESCO Gmbh – Germany). LDL cholesterol was determined by calculation using Friedewald's formula.[18]

Statistical analysis

Statistical analysis was carried out using Statistical Package for Social Science (SPSS for Windows, Version 20.0, SPSS Inc, Chicago, IL). The seroprevalence of *H. pylori* infection in the studied population was calculated as the proportion of serologically positive anti-*H. pylori* Ig G samples among all samples tested at 95 % confidence interval (CI). The variables were included into a multivariate logistic regression model, and the association of the potential risk factors with the studied pathology in the final model was expressed as odds ratio (OR) with 95% confidence intervals (CIs). The Chi-square test was used to compare frequencies of risks factors in the two groups. Biochemical parameters were subjected to analysis of variance and when a difference existed for each biochemical parameter taken individually, the test of Waller Duncan to the threshold of probability 5% was used to separate these averages. The data were expressed as the mean ±Standard Deviation (SD). The bivariate correlation of Pearson was used to determine association between pathological status of patients and variations of the biochemical parameters.

RESULTS

The study was carried out on a population of 160 voluntary patients of both sexes and of average age 53.91±13.36. The studied population was subdivided in two groups according to *H. pylori* IgG antibody seropositivity: a first group infected by *H. pylori* (Hp+) and a second group free from *H. pylori infection* (HP -).

The analysis of sociodemographic and clinical factors showed that male gender, age range of 21 to 30 years, single civil status, professional workers, student, level of higher education, source water from tap, abdominal pain and nausea/vomiting were all associated with higher odds ratio (OR >1) for *H. pylori* seropositivity (Table 1). There was no association between the age range 31 to 40 years (OR = 1.00; p = 0.902), anaemia (OR = 1.00; p = 0.762)

and *H. pylori* infection. Significant associations between *H. pylori* infection, the habit of not washing hands after toilets (OR = 3.33; p = 0.036) and giving of chewed food by the parents to children (OR = 2.26; p = 0.029) have been observed (Table 1).

Table 1: Effect of sociodemographic and clinical factors on *H. pylori* infection of study.

Characteristics of Participants	Frequency n (%)	*H. pylori* positive group (HP+, n = 80)	*H. pylori* negative group (HP-, n = 80)	Odds ratio (95% IC)	P value
Gender:Female	99(61.87%)	54(67.50%)	45(56.25%)	0.88(0.31-2.52)	0.970
Male	61(38.12%)	26 (32.50%)	35(43.75%)	1.127(0.39-3.20)	0.970
Age: 21-30 years	75 (41.66%)	51 (63.75%)	24 (30.00%)	1.46(0.59-3.61)	0.546
31-40 years	37 (20.55%)	16 (22.50%)	21 (26.25%)	1.00(0.32-3.07)	0.902
41-50 years	23 (12.77%)	8 (10.00%)	15 (18.75%)	0.92(0.23-3.73)	0.897
>51 years	25 (13.88%)	5 (6.25%)	20 (25%)	0.50(0.152-1.68)	0.431
Civil status: Single	78 (48.75%)	46 (57.50%)	32 (40.00%)	1.27(0.51-3.14)	0.761
Married	82 (51.25%)	34 (42.50%)	48 (60%)	0.97(0.39-2.38)	0.360
Profession: Civil servant	43 (26.87%)	18 (22.50%)	25 (31.25%)	0.97(0.35-2.65)	0.831
Informal worker	21 (13.12%)	17 (21.25%)	4 (5.00%)	1.29(0.33-5.00)	0.496
Housewife	36 (22.50%)	6 (7.50%)	30 (37.50%)	0.61(0.2-1.8)	0.183
Scholar	7 (4.37%)	2 (2.50%)	5 (6.25%)	0.61(0.05-7.08)	0.976
Student	53 (33.12%)	37 (46.25%)	16 (20.00%)	1.71(0.64-4.57)	0.739
Education level: Illiterate	11 (6.87%)	3(3.75%)	8(10.00%)	0.76(0.13-4.21)	0.874
Primary	17 (10.62%)	6 (7.50%)	11(13.75%)	0.70(0.16-2.95)	0.925
Secondary	48 (30.00%)	22 (27.50%)	26 (32.50%)	0.9(0.35-2.31)	0.978
Superior	84 (52.50%)	49 (61.25%)	35 (43.75%)	1.65(0.66-4.13)	0.384
Practicing physical activity	88 (55.00%)	38 (47.50%)	50 (62.50%)	0.59(0.23-1.49)	0.375
Smoker	9 (5.62%)	3 (3.75%)	6 (7.50%)	0.93(0.09-9.41)	0.688
Regular alcohol consumption	23 (14.37%)	8(10.00%)	15 (18.75%)	0.55(0.185-1.632)	0.404
Water source: Robinet	71 (44.37%)	42 (52.50%)	29 (36.25%)	1.4(0.57-3.67)	0.0773
Pit	40 (25.00%)	8 (10.00%)	32 (40.00%)	0.68(0.26-1.72)	0.0657
Boring	14 (8.75%)	3 (3.75%)	11 (13.75%)	0.13(0.023-0.78)	0.040*
others	35 (21.87%)	27 (33.75%)	8 (10.00%)	6.96(0.88-55.11)	0.071
No wash hands after saddles	88 (55.00%)	65 (81.25%)	23 (28.75%)	3.33(0.124-0.88)	0.036*
To eat into same dish	80 (50.00%)	45 (56.25%)	35 (43.75%)	1.08(0.41-2.82)	0.824
Food chewing by parents to children	39 (24.37%)	28 (35.00%)	11 (13.75%)	2.26(0.09-0.8)	0.029*
Abdominal pain	90 (56.25%)	52 (65.00%)	38 (47.50%)	1.14(0.36-3.53)	0.740
Digestive discomfort	49 (30.62%)	19 (23.75%)	30 (37.50%)	0.55(0.207-1.475)	0.639
Nausea/vomiting	41 (25.62%)	27 (33.75%)	14 (17.50%)	1.18(0.467-3.007)	0.602
Anorexia/thinness	30 (18.75%)	23 (28.75%)	7 (8.75%)	1.47(0.182-1.21)	0.177
Anaemia	39 (24.37%)	23 (28.75%)	16 (20.00%)	1.00(0.29-3.48)	0.762

* On the same line, values of the *H. pylori* positive group are significantly different to the *H. pylori* negative group; OR > 1: positive association with *H. pylori* infection, OR <1: negative association with *H. pylori* infection; OR=1 not association with factor and infection; Hp+: *H. pylori* positive; Hp-: *H. pylori* negative

Mean levels of total cholesterol (1.940g/l), LDL-cholesterol (1.576g/l), uric acid (7.03g/l in men and 4.84g/l in women) as well as total cholesterol/HDL ratio (11.97) in *H. pylori* positive patients were significantly increased compared to the control group (Table 2).

Table 3 presents a breakdown of biochemical abnormalities in the two groups of the study population. The analysis of the results showed that high percentages of total hypercholesterolemia (p = 0.029), LDL hypercholesterolemia (p = 0.024), total hypercholesterol /HDL cholesterol (p = 0.042), hyperuricemia (p = 0.009) and hypo-uricemia (p = 0.008) were observed in the group of patients infected with *H. pylori* compared to the uninfected group.

There were significant positive correlations between H. pylori IgG concentration and total cholesterol and uric acid levels; no significant correlation was found between H. pylori IgG concentration and LDL-cholesterol, ALT and TG levels (Table 4).

Table 2: Biochemical parameters according to *H. pylori* status.

Biochemical parameters	Unit (normal value)	*H. pylori* positive group, n = 80	*H. pylori* negative group, n = 80	*P value*
Total cholesterol	g/l (< 2)	1.94 0±0.065	1.550±0.121	0.001*
HDL cholesterol	g/l (> 0.40)	0.242±0.018	0.280±0.034	0.346
LDL cholesterol	g/l (< 1.30)	1.576±0.087	1.127±0.143	0.021*
Triglycerides	g/l (< 1.50)	1.090±0.079	1.060±0.130	0.173
ALT	UI/l (< 41)	24.954±1.870	24.831±2.989	0.972
Glucose	g/l (0.70-1.20)	1.042±0.023	1.036±0.037	0.405
Uric acid: Man	mg/dl (3.40-7.00)	7.030±0.641	5.38±1.070	0.017*
Woman	mg/dl (2.40-5.70)	4.840±0.410	3.970±0.670	0.017*
Total cholesterol /HDL-C	(≤ 4.50)	11.977±1.249	7.303±2.055	0.046*
LDL-C/HDL-C	(≤ 3.60)	9.193±1.186	5.410±1.952	0.106

* On the same line, values of the *H. pylori* positive group are significantly different to the *H. pylori* negative group; HDL: High Density Lipoproteins; LDL: Low Density Lipoproteins; ALT: Alanine Aminotransferase

Table 3: Distribution of biochemical abnormalities in the two groups of the study population.

Biochemical parameters	*H. pylori* positive group n = 80	*H. pylori* negative group n = 80	P value
Total hypercholesterolemia n (%)	24 (30.00%)	12 (15.00%)	0.029*
HDL hypercholesterolemia n (%)	73 (91.25%)	67 (83.75%)	0.358
LDL hypercholesterolemia n (%)	36 (45.00%)	23 (28.75%)	0.024*
Hypertriglyceridemia n (%)	11 (13.75%)	7 (11.25%)	0.613
Hyperuricemia: Man n (%)	10 (12.50%)	3 (3.75%)	0.016*
Woman n (%)	15 (18.75%)	8 (10.00%)	0.017*
Total n (%)	26 (32.50%)	11 (13.75%)	0.009*
Total Hypercholesterol /HDL-C n (%)	67 (83.75%)	53 (66.25%)	0.042*
Hyper LDL-C/HDL-C n (%)	23 (28.75%)	17 (21.25%)	0.114

*On the same line, values of the *H. pylori* positive group are significantly different to the *H. pylori* negative group; HDL: High Density Lipoproteins, LDL: Low Density Lipoproteins.

Table 4: Correlation between H. Pylori IgG level and some biochemical parameters.

Biochemical Parameters	Correlation coefficient of Pearson (r) / p value						
	T. Cho	HDL-C	LDL-C	TG	ALT	Glucose	Ur. Ac
H. pylori IgG level	0.233/ 0.017*	-0.010/ 0.917	0.136/ 0.168	0.057/ 0.547	-0.040/ 0.686	0.066/ 0.505	0.195/ 0.047*

*positive correlations, p<0,05; IgG: Immunoglobiline G, HDL: high density lipoprotein, LDL: low density lipoprotein; TG: triglycerides; ALT: Alanine aminotransferase; Ac. Ur: uric acid.

DISCUSSION

The findings of this study indicated a strong association between *H. pylori* seropositivity and some sociodemographic parameters like male gender, age range between 21 to 30 years and professions: student and informal workers. This observation shows that these persons are more exposed to *H. pylori* infection according to their odds ratio (OR>1). These results are in agreement with those of the early studies.[19,20] Fecal-oral contamination is done through the hands especially during diarrhea when the hands are not properly washed. On the other hand, oral-oral and gastro-oral contaminations are mostly through saliva or gastric liquid from parents to children or equally amongst of couple if one person is infected.[21] Indeed, the results of the present study reveal that the habit of not washing hands after the toilets and the habit of chewing food by the parents before giving to children were independent risk factor for *H. pylori* infection.

Present study showed no increased risk for regular tobacco and alcohol consumptions highlighted by the negative association (OR <1) between *H. pylori* infection and these two factors. These results partially corroborate those of Ogihara et al.[22] who showed that consumption of tobacco is negatively associated to *H. pylori* infection

(protector effect) and reasonable consumption of alcohol makes spontaneously easy the elimination of *H. pylori*.[23]

The findings of the present investigation also demonstrated that *H. pylori* infection caused increases of total cholesterol level, LDL-cholesterol level and total cholesterol/HDL cholesterol ratio of infected subjects compared to the control group. Indeed, due to lipopolysaccharides present at level of the cell wall of negative Gram bacteria like *H. pylori*, there is the stimulation of large quantities of cytokines (TNF-α and IL-6) which inhibit lipoprotein lipase activity. The consequence being mobilization of lipid tissue through an increase in serum triglyceride level and in contrast, a decrease in serum HDL cholesterol level.[24.25] Abnormal high elevated levels of total cholesterol (P = 0.029) and LDL cholesterol (P = 0.024) were observed in the group of patients infected with *H. pylori* compared to the uninfected group. These results are in agreement with those of Kim et al who showed that *H. pylori* is independently associated to elevated LDL cholesterol levels.[26]

Besides the total cholesterol and LDL-cholesterol abnormalities described above. an increase of total cholesterol/HDL cholesterol ratio represents an additional absolute value; indicating a predisposition to the process of atherosclerosis and it is recognized as a reliable indicator for the assessment of the risk of coronary heart disease.[27] In this respect, patients of group HP+ with the total cholesterol/HDL cholesterol ratio significantly high, have an atherogenic risk greater than those of control group. This result is similar to those reported in the literature.[12.14] Further, our data showed that *H. pylori* infection significantly modified serum uric acid level. Previous studies demonstrated that chronic *H. pylori* infection involves significant increase in uric acid serum level while creatinine serum level decreases in a significant manner.[28.29]

CONCLUSION

The results of the present study demonstrated that the habits of not to washing hands after the toilets and giving of chewed food by the parents to children were independent risk factors of *H. pylori* infection. The findings of this study also showed that there is a derangement of the total cholesterol/HDL-cholesterol ratio. total cholesterol and LDL-cholesterol values in *H. pylori* patients, which creates an atherogenic lipid profile and hence could promote atherosclerosis. Moreover, *H. pylori* infected patients had increased uric acid level that creates hyperuricemia which could promote gout. These data confirm the existence of a possible association between *H. pylori* infection, lipid profile and uric acid.

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