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Original Research Article

Prevalence of *Helicobacter pylori* Infection in Diabetics Type 2 and Non-Diabetics Subjects in Brazzaville CHU

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Abstract: *H. pylori* is a micro-aerophilic, gram-negative, S-curved, polar motility, spiral bacillus measuring 2.5 µm to 5 µm long and 0.3 µm wide. Type two diabetes of mellitus is a metabolic disorder characterized by chronic hyperglycemia associated with disturbances of the various metabolisms, in particular lipid, carbohydrate and protein. In this study, we aimed to determine the prevalence of *H. pylori* infection in the diabetic and non-diabetic population consulting in the gastroenterology and external medicine department of CHU-Brazzaville. We carried out a descriptive cross-sectional study over a period from June 20 to November 02, 2021, like a period of six months. Ninety patients were selected divided into two groups, each subdivided into two subgroups. 44 type two diabetes of mellitus patients and 46 non-diabetic patients were included. The average age of diabetic patients was 51 ± 11 years old with an average duration of diabetes evolution of 5.54 ± 4.58 years old. The average age of non-diabetic patients was 40±15 years old. Out of 90 patients in our study population, we had a predominance of women (68) compared to men (22). The overall frequency of *H. pylori* infection of the study population was 57%. It was 66% in diabetic patients and 48% in non-diabetics. The results of our study showed that *H. pylori* infection was more common in diabetics compared to non-diabetics.

Keywords: *Helicobacter pylori*, Type two diabetes and non-diabetics.

T2DM: Type two diabetes of mellitus and NDT: Non-diabetics.

1. INTRODUCTION

Helicobacter pylori ubiquitous bacterium is a micro-aerophilic, S-curved gram-negative spiral bacillus, with polar mobility, measuring 2.5 µm to 5 µm long and 0.3 µm wide**.** The prevalence of *H. pylori* infection varies by geographic location, ethnicity, socioeconomic status, and age [1]. *H. pylori* infection affects approximately 50% of the worldwide population [2]. Its prevalence is higher in developing countries exceeding 95% in some African countries [3]. The prevalence of *H. pylori* in Congo- Brazzaville was estimated at 89% among patients seen for upper digestive endoscopy in the Gastroenterology and External Medicine department in 2015 [4]. *H. pylori* infection is associated with many gastrointestinal diseases such as gastritis, gastric and duodenal ulcers, gastro-esophageal reflux disease, MALT lymphoma and gastric cancer and is implicated in other extra-gastrointestinal diseases such as diabetes mellitus, thyroid it is, ischemic heart disease, arterial hypertension, dermatological diseases, rheumatologic diseases and cerebro-vascular diseases [5]. Diabetes mellitus (DM) is a common, chronic and progressive metabolic disease characterized by chronic hyperglycemia due to the destruction of Langherans ß cells or secondary to insulin resistance and/or abnormal insulin secretion or both and associated disturbances of the various metabolisms, in particular carbohydrates, lipids and proteins [6]. Its prevalence is now experiencing exponential growth in the world in general, and particularly in Africa. On a global scale in 2017, its prevalence was 425 million people [7]. The International Diabetes Federation (IDF) estimates that in 2035 this figure will reach 592 million people and 629 million in 2045. In Africa according to a report published by the

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World Health Organization in 2017, diabetes mellitus affects approximately 7.1% people. In Congo, according to the WHO report published in 2016, the prevalence of diabetes mellitus was estimated at 5.7% [8]. The results of various studies are contradictory; the frequency of *H. pylori* is higher in diabetic patients than in non-diabetic patients [9, 10].

Simon and his collaborators who found that the prevalence of H. pylori infection in patients with diabetes was significantly higher in diabetic patients than in non-diabetic controls 62% versus 21% [11] first explored the interrelationship between H. pylori infection and diabetes in 1989. In Africa, studies carried out in Egypt and Cameroon respectively reported prevalence of 54% versus 28% and 88.2% versus 67.7% in diabetic and non-diabetic patients [12, 13]. In Congo Brazzaville, there is not yet a published study on the prevalence of *H. pylori* infection in diabetics and non-diabetics. The main aim was to determine the prevalence of *H. pylori* infection in the diabetic and non-diabetic population consulting in the gastroenterology and external medicine department of CHU-Brazzaville.

2. MATERIALS AND METHODS

2.1. Setting, type, period and during of study

The Gastroenterology and External Medicine Department of Brazzaville University Hospital was chosen for the recruitment and sampling of our patients and the laboratory of the Faculty of Health Sciences for the analysis of the samples. We carried out a descriptive cross-sectional study over a period from June 20 to November 2, 2021, during a period of six months.

2.2. Population of Study

Our study population consisted of male and female subjects with type2 diabetes and non-diabetics.

2.3. Inclusion Criteria

Included in this study were (1) the non-diabetic patients of 18 to more years old and (2) type 2 diabetic patients of 40 to more years old followed by the Endocrinology and Metabolic diseases service of CHU-Brazzaville and living with diabetes for less than ten years old due to that patients living with diabetes for more ten years old had more diabetics complications than those who had less ten years old according to data from the literature and (3) all consultants in the Gastroenterology and External Medicine consultant service CHU-Brazzaville for gastro-duodenal warning signs making suspect *H. pylori* infection.

2.3. Exclusion Criteria

Have not been included in our study patients with (1) diabetes mellitus type1; (2) patients with hemorrhage digestive; (3) patients on antibiotic treatment following clarithromycin and amoxicillin as well as a proton pump inhibitor for less months and (4) others treatments for eradicating *H. pylori* infection.

2.4. Data Gathering

Patients meeting our criteria were given a questionnaire, and we were the subject of a double survey: an epidemiological survey, which enabled us to collect epidemiological data, in particular age, weight, BMI and evolution of diabetes, and a biological survey, which allowed us to carry out the search for the antigen of *H. pylori* in the stool.

2.3. Sampling Method and Size

We carried out a systematic non-probability sampling between T2D and non-diabetic patients seen in the Gastroenterology and External Medicine department of the University Hospital Center of Brazzaville consulting for gastro-duodenal warning signs, in which *H. pylori* infection was suspected. This made it possible to section a number of 94 patients. Among these patients, four were excluded because of the non-realization of the deposition of the stools. We had 90 patients divided into two groups, each subdivided into two subgroups according to the results of the search for the antigen of *H. pylori* in the stool:

Group 1: 44 diabetic patients

Group 2: 46 non-diabetic patients

3. METHOD AND ANALYSIS OF SAMPLING

3.1. Epidemiological investigation

It allowed us based on a questionnaire to collect the following different anthropometric variables:

3.2. Body weight: This variable anthropometry was taken from the patient's consultation file.

3.3. Size: It was found in the file medical of some patients. We have also measured the height of other patients. The subject was placed upright, heels together, and toes slightly apart to allow even distribution of weight on both legs. The arms hung freely on either side of the trunk and the feet touched the ground.

3.4. Body mass index: It was obtained by Lambert Adolph Jacques Quételet's formula:

$\boldsymbol{BMI = \frac{weight}{(size)2}}$ **,** Body Mass Index: on spoke of being overweight when the BMI was between 25-29 kg/m^2 and obesity when BMI was>30kg/m^2.

3.4. Biological Investigation

It allowed us to search for the antigen of *H. pylori* in the stool. It was carried out in two phases:

3.5. Stool Collection Procedure

We gave the patient a sterile pot containing a spatula and a paper towel while explaining to him the procedure for collecting stools: Collect fresh stools in the morning, defecate on clean mud avoiding contact between urine and stools, take a dab of saddle using the spatula, put a dab of saddle in the sterile jar, close the jar hermetically and put it in the plastic packaging intended for this purpose.

3.6. Searching of *H. pylori* Antigen in Stool

The search for the monoclonal antigen of *H. pylori* was performed through rapid stool tests using the JusChek kit. We followed the following steps to search for *H. pylori* in the stool: Unscrew the cap of the sample collection tube then randomly into the fecal sample in three different sites to collect 50mg of feces, Put the applicator in the tube containing the sample collection swab. Extraction, Close the tube and shake vigorously to mix the sample and the extraction buffer well, distribute 3 drops or 90µl of the mixture in the sampling well of the cassette and set the stopwatch to 10 minutes according to the instructions of the manufacturer of the reagent. Read the results. Positivity or negativity of the test to prick the sample collection applicator appearance of two bands (one in the control zone and the other in the test zone). The appearance of a single band at the level of the control zone marked the negativity of the test and the *H. pylori*: the test was considered positive by the appearance of a single band at the level of the test zone translated an invalid test.

4. Ethical Approval

Type two diabetic and non-diabetic patients consulting in the gastroenterology department and of the Internal Medicine of the hospital center University of Brazzaville and spreading to our criteria written informed consent was obtained for each of them. The Brazzaville Health Sciences Research Ethics Committee (CERSA) approved our study.

5. Statistical Analysis

Excel 2013 software was used for the design and development of the database and RStudio software for data processing. Quantitative variables were expressed as means ± standard deviation, and qualitative variables were expressed as numbers and percentages. The comparison of the qualitative variables was made by the Pearson chi2 test and the comparison of the quantitative variables was made by the mann-whitney test. Analyses were carried out using SPSS software (version 26.0; IBM).

6. Limits of Study

The main limitations of our study were the small size of the sample and the period of realization of this work, which was relatively short. The size of sample was small compared to the large cohorts carried out in internationals studies because all the biological examinations carried out for the population of our study were at our expense.

7. RESULTS

Figure 1 shows the distribution of the prevalence of the study population according to gender. The overall distribution of the study population was 90 patients; men were 22 in number with prevalence of 18% of diabetic patients and 30% of non-diabetics patients, women were 68 with a prevalence of 82% of diabetic patients and 70 % of non-diabetics patients, the sex ratio was 0.32. Statistical analysis of the results showed no statistically significant difference.

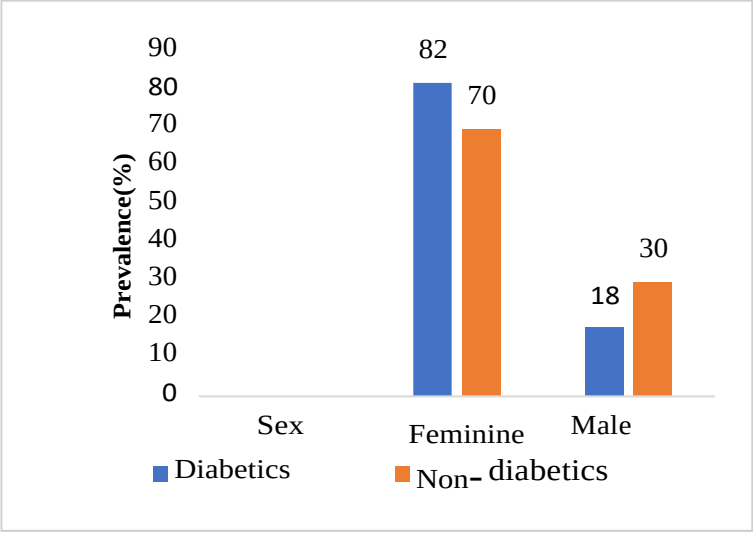

Figure 1: Distribution of the prevalence of the study population according to gender

Figure 2 shows the distribution of the prevalence of the study population according to age. The average age of our study population was 45 ± 14 years with extremes ranging from 18 years and 70 years. The average age of diabetics was 51 ± 11 years and non-diabetics were 40 ± 15 years. The most represented age group was that of 30 to 50 years with a prevalence of 52% in diabetic patients and 34% in non-diabetic patients.

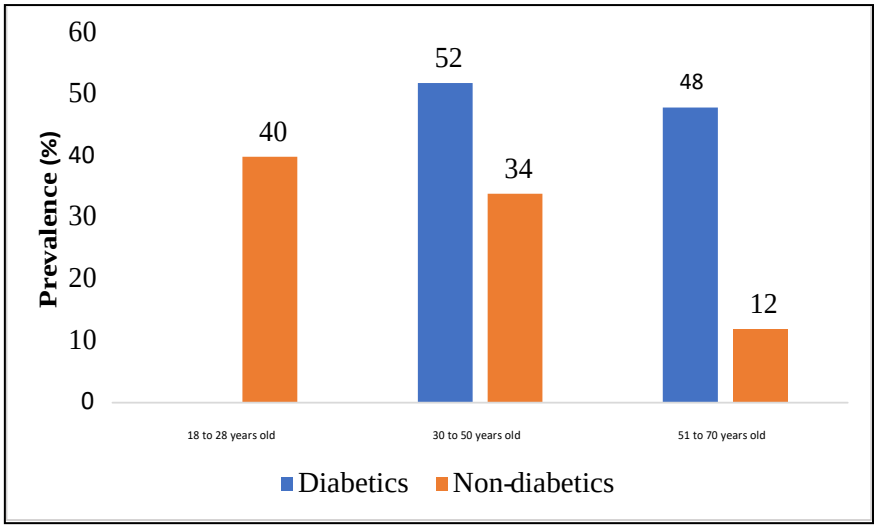

Figure 2: Distribution of the prevalence of the study population according to age.

Table 1 shows the average duration of diabetes progression. It was 5.54 ± 4.58 years with extremes ranging from one month to 10 years. The most represented age group was that of 1 to 5 years with a frequency of 48%.

Table 1: Distribution of the diabetic population according to the duration of diabetes progression.

Duration (years)	Effective (n)	Percentage (%)
<1	7	16
[1 - 5]	21	48
[6 - 10]	16	36

Table 2 shows the distribution of the study population according to the means of the anthropometric characteristics.

Table 2: Distribution of the study population according to the means and anthropometric characteristics.

Variables	*Diabetics (n = 44)*	*Non Diabetics (n = 46)*	*Total (n = 90)*
Size (m)	1.57±0.07	1.64±0.09	1.61±0.09
Weight (kg)	68±13	69±13	68±13
BMI (kg/m^2)	27.7±6.1	25.8±5.3	26.7±5.8

Figure 3 shows the repartition of the prevalence of *H. pylori* infection according to diabetics and non-diabetics. The overall prevalence of *H. pylori* infection in our study population was 57%. Of the 44 diabetics, patients 66% of patients were infected and 34% patients were uninfected. Of the 46 non-diabetics, patients 48% of the patients were infected and 52% of the patients were uninfected, the statistical analysis of our results showed a statistically significant difference ($p < 0.05$).

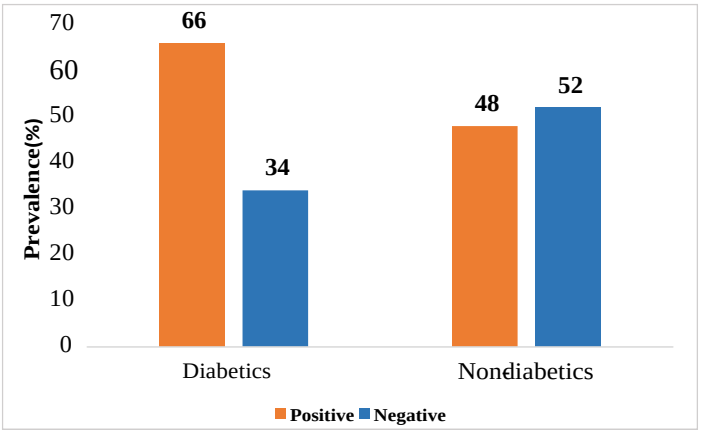

Figure 3: Repartition of the prevalence of *H. pylori* infection in the two groups

Figure 4 represents the distribution of the prevalence of the diabetic population according to the duration of diabetes and infection *H. pylori*. The most infected age group was that of 6 to 10 years, the statistical analysis has no statistically significant difference (p = 0.9)

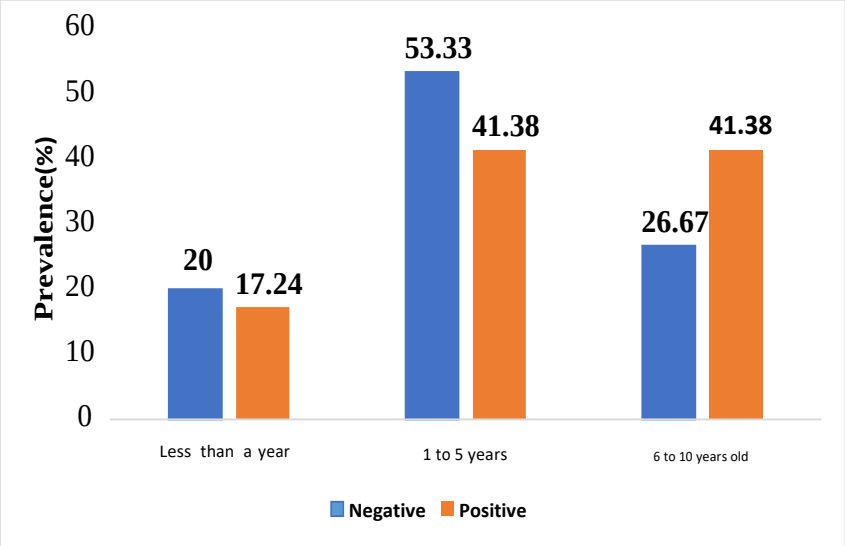

Figure 4: Distribution of the prevalence of the diabetic population according to the duration of diabetes progression and *H. pylori* infection

Table 3 shows the distribution of epidemiological characteristics according to *H. pylori* infection. Infected women represented 76.47% and men 23.52% of the overall population. Infected women represented 86.20% and men 13.79% of diabetic patients and concerning non-diabetics patients infected women represented 63.63% and men 36.36%. The most infected age group in the diabetic population was 51 to 61 years old and 18 to 28 years old in the non-diabetic population.

Table 3: Distribution of epidemiological characteristics according to *H. pylori* infection

	Diabetics (n=44)		**p-value**	**Non Diabetics (n=46)**		**p-value**
	***H. pylori* positive n (%)**	***H. pylori* negative n (%)**		***H. pylori* negative n (%)**	***H. pylori* positive n (%)**	
Sex			**0.08**			**0.06**
Women	25(86.20)	12(80)		18(75)	14(63.63)	
Men	4(13.79)	3(20)		6(25)	8(36.36)	
Age (years)			**0.312**			**0.221**
18 – 28	-	-		7(29.17)	8(36.36)	
29 – 39	-	-		6(25.00)	5(22.72)	
40 -50	10(34.48)	6(40)		4(16.17)	3(13.63)	
51 – 61	11(37.93)	7(46.66)		5(20.84)	4(18.18)	
62 – 72	8(27.58)	2(13.34)		2(8.34)	2(9.11)	
BMI (kg/m^2)	28.03±3.12	27.51±4.25	0.420	26.78±5.02	24.98±5.18	0.348

8. DISCUSSION

Patients with diabetes are generally prone to chronic infections. However, the results of several studies looking at the frequency of *H. pylori* infection in diabetic patients are contradictory. The main aim of this study was to determine the prevalence of *H. pylori* infection in the type 2 diabetic population. Out of ninety patients of the population of our study, we obtained a predominance of women 68 compared to men 22. The infected women represented 76.47% and the men 23.52%. Although the prevalence of *H. pylori* infection of women in this study was predominant, statistical analysis did not show any statistically significant difference. This result agrees with that of Mohammed *et al.*, on the other hand it differs from that obtained by Jamshid *et al.*, who had noted a male predominance [14, 15]. This difference could be explained by the fact that in our study there was a greater participation of women compared to men. The average age of our study population was 45±14 years old. The average age of diabetic patients was 51 ± 11 years old and non-diabetics were 40 ± 15 years old. Our results can be superimposed on those obtained by de Ebule *et al.*, in Cameroon who had obtained an average age of 55.9 ± 9.8 years old and 40.3 ± 13.8 years old respectively in diabetic and non-diabetic patients and contrary to those of Mysara *et al.*, in Egypt who had obtained an average of 48 ± 11 years

old in diabetic patients and 34 ± 14 years old in non-diabetics [2, 16]. *H. pylori* infection correlated with age, the present study showed that the infection rate varied across age groups in diabetic and non-diabetic patients. The most infected age group was 51 to 61 years old in diabetics and 18 to 28 years old in non-diabetics. Nidhal *et al.,* in Iraq had noticed that the rate of infection was higher in the age group of 56 years old and over in diabetic patients and from 15 to 25 years old in non-diabetic patients, while Zafar and *al.* found that the rate of *H. pylori* infection was high in diabetic and non-diabetic patients in the 41-50 age group [17, 18].

This could be explained by the late detection of *H. pylori* infection and by the reduction of the immune defenses of infected subjects. The average duration of diabetes was 5.54 ± 4.58 years old and the most infected slice was that of 6 to 10 years old. The association between *H. pylori* infection and the mean duration of diabetes progression showed no significant difference. Regarding body mass index, no statistically significant difference was observed between infected diabetic and non-diabetic patients in our study. Our results are consistent with amongst results found in the literature. Abdullah *et al.,* in Saudi Arabia as well as Oluyemi *et al.,* in Nigeria had noted that the prevalence of *H. pylori* infection was neither associated neither with the duration of diabetes progression nor also with the body mass index bodily [19, 20]. The overall prevalence of *H. pylori* infection in our study was 57%. We obtained a prevalence of 66% of *H. pylori* infection in the diabetic population versus 48% in non-diabetic patients, the statistical analysis showed statistically significant difference between diabetic patients and non-diabetic patients infected by *H.pylori* infection. Our results were similar to those obtained by Yusuf *et al.,* in Turkey who had obtained a prevalence of 64.5% in diabetic patients against 43.6% in non-diabetics patients with 53.4% of the overall prevalence of all patients and those of Nidhal A. *et al.,* in Iraq who had obtained a prevalence of 57% in diabetics patients and 43% in non-diabetic patients [11, 17]. Although others studies have not obtained this frequency, Sarita Bajaj *et al.,* found that the prevalence of *H. pylori* infection was 77.5% in T2DM patients and 58.3% in non-diabetics patients, Patrick Adu *et al.,* in Ghana who had obtained a prevalence of 46% in diabetics patients against 39% in non-diabetics patients and those of Pareek *et al.,* who had obtained a higher prevalence of 88% in diabetics patients against 76% in non-diabetics patients [21, 13, 22].

This difference could be explained by the methods used for researching *H.pylori* infection, most of the studies used serological methods for the search for *H. pylori* unlike our study and by genetics, environmentals and geographics factors. Also by the size of our sample, which was small in our study compared to large studies including more than 300 patients, by the fact of the decrease in cellular and humoral immunity and diabetic gastroparesis. Despite these differences, our work shows a higher frequency of infection with H. pylori in the diabetic subject.

9. CONCLUSION

Our study showed that infection with H. pylori was present in diabetic and non-diabetic patients. Statistical analysis of our results showed that diabetic patients were more infected than non-diabetic patients were which shows that diabetic patients are susceptible to infections. However, the small size of our sample could not allow us to speak of a greater susceptibility to this infection within the diabetic population.

Conflicts of Interest: There were no conflicts of interest.

Financial Support and Sponsorship: We declare that we have not received any financial support or sponsorship.

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