EPIDEMIOLOGICAL STUDY OF GASTRODUODENAL DISEASES (*HELICOBACTER PYLORI*) IN THE REGION OF TIARET, ALGERIA

DOUKANI Koula[12*], BOUHENNI Hasna[1], BOUKIRAT Dyhia[3], HADJARAB Mohamed Hocine[1], MOKHTAR Asma[1], ZAHI Racha[1]

[1*]*Department of Biology, Faculty of Nature and Life Sciences, University of Tiaret, Tiaret, Algeria;*
[2*]*Laboratory of Animal Production Sciences and Techniques, University of Mostaganem, Algeria;*
[3]*Department of Nature and Life Sciences, Faculty of Science and Technology, University of Tissemsilt, Tissemsilt, Algeria;*

[*]Corresponding Author DOUKANI Koula, e-mail: kouladoukani@gmail.com;

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ABSTRACT

It was judicious to estimate the prevalence of infection by *Helicobacter pylori*, responsible for several gastroduodenal pathologies in the region of Tiaret, targeting a retrospective cohort of 1230 patients, presenting symptoms of gastroduodenal diseases, collected over a period of 6 years (2015-2020) at the hepato-gastroenterology department of EPH Youcef Damardji in Tiaret. After an analytical study, it turns out that our studied population has a considerably high prevalence rate of infection 69%, and this under the influence of three preponderant factors: sex (male), age (from 50 to 59 years old) and the region where the prevalence is considerably greater in the city of Tiaret than that recorded in rural areas. On the other hand, diseases associated with *H. pylori* such as ulcer, gastritis and gastric cancer have a great influence on this prevalence.

Keywords: *Helicobacter pylori*, infection, gastroduodenal diseases, retrospective, prevalence, epidemiology, Tiaret.

INTRODUCTION

Helicobacter pylori is a Gram-negative bacterium in helical form from which it takes its name *Helicobacter*, provided with flagella and discovered in the stomach of mammals and human cadavers (Marshall and *al.*, 1986). This micro-organism was cultivated only in 1982 by the two Australian researchers J. Robin Warren (pathologist) and Barry J. Marshall (gastroenterologist). Its manifestations have been reported in the scientific literature for over 100 years (Marshall et *al.*, 1986). *H. pylori* is a pathogenic microorganism that infects the gastric mucosa, known as the only bacteria that can survive in such an acidic environment. *H. pylori* infection is the main cause of several gastroduodenal diseases such as peptic ulcer disease, acute and chronic gastritis, MALT's lymphoma as well as being implicated in gastric cancer (Thomson and Flook, 1997). The eradication treatment of this bacterium is the combination of several antibiotics and inhibitors of acid secretion. Resistance to these antibiotics sets in and regularly modifies the recommendations for this treatment, so antibiotic resistance has become a real public health problem (Romain, 2018). *H. pylori* infection is one of the most common infections worldwide, its prevalence varies between countries and their socio-economic levels (Suerbaum and Michetti, 2002). Understanding its epidemiology

is the most essential step in developing appropriate public health measures. It is estimated that the prevalence of this infection is higher in developing countries where it can reach 80% to 90% of the young adult population compared to 40% or less in developed countries (Heluwaert et *al.,* 2014) . In Algeria, there are very few recent data on *H. pylori* infection. A serological study in the 1980s reported a prevalence of 80% in the Algerian population (Megraud et *al.,* 1989). Another study on a smaller scale carried out in Algiers reports a prevalence of 62% in 2015, Algeria still one of the regions presenting a high prevalence of the infection, but an update of the data is necessary (Djennane-Hadibi et *al.,* 2016). In this context, the aim of our work is to determine the prevalence of *H. pylori* infection in patients hospitalized at the EPH of the wilaya of Tiaret suffering from gastric pathologies, over a period of 6 years (2015- 2020) and to study the impact of different epidemiological factors as well as the main gastric diseases.

MATERIALS AND METHODS

Study Site

The city of Tiaret is located in northwestern of Algeria. Its population is estimated at 932.442 inhabitants and covers an area of 20 673 km². It has four specialized hospitals, five public hospitals and 42 public health facilities of proximity. The Hospital of Tiaret "Youcef Damardji", was selected for data collection in the Gastro-hepato-enterology department.

Study Population

It is a retrospective and descriptive study on 1230 patients (567 women and 663 men) who are between 4 and 99 years old, over a period of 6 years from January 2015 to April 2020. They presented digestive symptoms (abdominal pain, vomiting, nausea, gastric burn) and have benefited from a high digestive fibroscopy. The medical form mentioned the name, age, sex, nature of the sampling site, and clinical diagnosis.

Inclusion Criteria

1. Patients of origin from the region of Tiaret;
2. Patients with gastroduodenal diseases;
3. Each patient was undergoing a gastric biopsy.

Study Design

The gastroenterologist had performed a high digestive endoscopy, which had allowed biopsy sampling, often at the level of the antral regions, sometimes at the antro-fundic or pyloric. These biopsies were often fixed with formalin and they constitute the biological material object of histopathological examination. Then, they were sent to the Laboratory of Anatomo-cyto-pathology for a histological study. The histological examination of gastric biopsies by hematoxylin– eosin staining which makes it possible to determine the type of histological lesions caused by *H. pylori*, has always been supplemented by slow Giemsa staining, which gives a better contrast for the bacterium. This examination makes it possible to obtain a good morphological quality of the abnormalities of the gastric mucosa, notably an inflammation or an atrophic process.

Data Collection

1. The first step was to look for cases of gastroduodenal diseases from the histopathological examinations on gastric biopsies.
2. The second step was to determine the cases of gastroduodenal diseases caused by *H. pylori* or not.
3. The third step was to study the distribution of gastroduodenal diseases due to *H. pylori* by sex, age groups, sampling site, and type of gastric pathology associated with this bacterium.

Statistical Analysis

Descriptive statistics, counts, and percentages were calculated using IBM SPSS Statistics Subscription Trial for Microsoft Windows 64-bit. IBM SPSS non-parametric one-sample Chi- square test ($p \leq 0.01$).

RESULTS

Involvement of H. pylori in gastroduodenal diseases

Among the 1230 patients with peptic diseases, we found 849 *H. pylori* infected patients who give an infection rate of 69.02% (Table 1).

Table 1. Percentage of patients infected or not with *H. pylori.*

Population	Number	Percentage (%)
Population infected with *H. pylori*	849	69.02
Population not infected with *H. pylori*	381	30.98
Total	1230	100
$\chi 2 = 76.42$, $p < 0.01$.		

Distribution of H.pylori infection by age group

Table 2 shows the prevalence of *H. pylori* infection by age group. The difference of values between ages gave a maximum rate of 24.85% in patients aged between 50 and 59 years. Indeed, we have noted a frequency of 1,29%, 12.6%, 14%, 16%, 15,07%, 9,42%, 4,47% and 2,12% of *H. pylori* infection in the age group and ranging successively for '0–19', '20–29', '30–39', '40–49', '60–69', '70–79' , '80–89' and '90–99' years (Table 2).

Table 2 | Prevalence of *H. pylori* infection by age group.

Age group	Prevalence (%)
0–19	1.29
20–29	12.6
30–39	14
40–49	16
50–59	24.85
60–69	15.07
70–79	9.42
80–89	4.47
90–99	2.12
$\chi 2 = 5.789$, $p < 0.01$.	

Distribution of H.pylori infection by gender.

The incidence of *H. pylori* infection was slightly higher in men than women. Results showed that the prevalence was 59 % in male, which is statistically greater than in female (41%) (Table 3).

Table 3. Prevalence of *H. pylori* infection by sex of patients.

Sex	Number	Prevalence (%)
Female	350	41
Male	499	59
$\chi 2 = 7.58$, $p < 0.01$.		

Distribution of H.pylori infection by region.

The results of our study show that the industrialized city of Tiaret recorded a prevalence of 72% in comparison with rural areas which recorded 28% (Table 4).

Table 4. Prevalence of *H. pylori* infection by region.

Region	Number	Prevalence (%)
Industrialized city	612	72
Rural areas	237	28
$\chi 2 = 73.49$, $p < 0.01$.		

Distribution of H. pylori infection according to type of pathology

H. pylori infection has become the unavoidable etiological factor of many gastric diseases, the data obtained in our study on a population of 1230 patients admitted to the gastro-hepato-enterology department at the EPH of Youcef Damardji during the last 6 years (2015-2020) and who present digestive symptoms such as abdominal pain, nausea, vomiting show that 849 cases (69.02%) of the population studied are positive for the infection. These results indicate that 268 cases (31.5%) presented with gastritis, 168 cases (19.07%) had ulcers, 253 cases (29.7%) with gastric cancer and 2 cases (0.2%) with MALT lymphoma and 18.82% included d other pathologies linked to *H. pylori* such as: bulbitis (34), antritis (119) and stenosis (5).

Table 5. Rates of different gastric pathologies in the population associated with *H. pylori.*

Pathology associated with infection	Number	Prevalence (%)
Gastritis	268	31.5
Ulcers	168	19.07
Gastric cancer	253	29.7
MALT lymphoma	2	0.2
Bulbite	34	18.82
Antritis	119	
Stenosis	5	
$\chi 2 = 14.27$, $p < 0.01$.		

Discussion

In underdeveloped countries, the prevalence of *H. pylori* among symptomatic patients ranges from 70% to 95%, while in developed countries, it ranges from 30% to 50% (Khoder et *al.,* 2019). The present results are similar to those found in Morocco which showed that among 755 patients, 521 cases were infected with *H. pylori* with a prevalence of 69% while 234 cases were uninfected with this bacterium with a prevalence of 31% (Joutei et *al.,* 2010). According to Kasmi et *al.* (2020), the prevalence of *H. pylori* infection in Sidi Belabbés (Algeria) was exorbitant (66.12%) with 486 patients infected by this bacterium, also the results found by Traore (2020) at Sikasso Hospital (Mali), showed that 199 cases were recorded as positive for *H. pylori* infection with 79.6% prevalence. The frequency of prevalence noted is observed in many African countries which is between 56.4% and 91.3% but which remains higher than European data where the frequency is less than 45% (Diamonde and *al.,* 1991; Sobalah et *al.,* 1991). The infection is acquired during childhood, living conditions in childhood play a decisive role. Prevalence depends on socioeconomic status as well as sanitation levels. The low-infection association with the socio-economic level is indeed constantly found (Forman, 1995).

Concerning the prevalence of *H. pylori* infection by age, we obtained a peak rate (24.85%) affecting the '50–59' age group. These results concurred with studies carried out in Morocco and Côte d'Ivoire which show a very high prevalence of infection with 69.2% and 69% respectively (Kai et *al.,* 2001; Essadik et *al.,* 2013). Those results correspond well to the prevalences noted in developing countries (Diomandine et *al.,* 1991). However, the prevalence in our research remains lower than that found in Saudi Arabia (80%) (Marie, 2008). In contrast, it was higher to the European data where this frequency does not exceed 30% (Megraud, 2011). According to a Canadian study carried out by Botuna Eleko (2003), the prevalence of *H. pylori* increases with age in statistically significant degree. the results exhibit that the North America (USA) show an increase in prevalence (15%) with age in the groups of 25-34 years old and 35% in the groups of 55-64 years old. Graham and Malatay (1991) also showed an increase with age of 1% per year in the general population.

As a result, *H. pylori* infection predominates in young subjects and persists throughout life in developing countries, however in industrialized countries where the prevalence increases with age and that the old population has the opportunity to be infected the most (Ramanampamonjy et *al.,* 2007). Our observation that infected patients are older may be explained by the cohort effect: older people were infected in childhood at a time when the prevalence of infection was higher. Indeed, some studies have confirmed this observation from which they have concluded that contamination occurs early in childhood (Vincent, 1996; Elmanama et *al.,* 2008). The cohort effect is defined as a variation in health status, which results from the different causal factors to which each birth cohort of a population is exposed, such as social and environmental changes (Parsonnet et *al.,* 1992; Banatvala et *al.,* 1993).

Our results show a male predominance in the prevalence of *H. pylori*. This explains why the female-male distribution is unbalanced, 350 female patients with a prevalence of 41% against 499 male patients with a prevalence of 59%, corresponding to an M/F= 1.43 in favor of men. Our results are compatible with the study of Adel and Borei (2013) conducted in Egypt, of which they confirmed the male predominance with 29 cases men with a prevalence of 58% and 21 cases women with a prevalence of 42%. Waleed et *al.* (2019) have just confirmed our results, where they recorded a prevalence of 58% in men while in women it is 42% with a male/female ratio = 1.38. Our results are different from those found by Kasmi et *al.* (2020) in the region of Sidi Bel Abbès (Algeria) where they demonstrate that women have a prevalence of 69.33%, while men have a prevalence of 60.66%. So the infection affects the two sexes differently.

A study conducted in Yemen by Almashhadany and Mayass (2018) showed that women are more exposed to *H. pylori* infection with a prevalence of 85.71%, compared to 76.71% in men. According to Elmanama et *al.* (2008), there is no significant difference in the overall prevalence of *H. pylori* infection between men and women. And both seem to be equally exposed. The result of our study can be attributed to some male habits like smoking, alcohol consumption and diet-related factors that could damage the gastric mucosa and alter the internal environment of the stomach (Adel and Borei, 2013). Although further research is needed to understand the mechanisms by which sex may influence the acquisition and/or persistence of infection, our results support a weak contribution of sex differences in the prevalence of *H. pylori* -linked infection to male predominance.

The results of our study show that the city of Tiaret recorded a prevalence of 72% contrary to rural areas which recorded 28% prevalence. The study carried out in Quebec by Botuna (2003) in four regions showed that rural areas are the most affected, among the 1,236 patients who were infected with *H. pylori*, including Lanaudière, which is the only industrial city with 21 cases and one prevalence of 8.90%, Iles d'Orléans with 45 patients (19.07%), Nicolet with 14 patients and 5.93% prevalence, Portneuf dominates in number with 156 cases of *H. pylori* and 66.10% prevalence. Other studies carried out in Lima which is an industrialized city in Peru reported that 37% of children who consume municipal water were more affected by the infection.
H. pylori compared to only 4% for children whose water source was community wells, for young patients the water source is an important source of *H. pylori* infection (Klein et *al.*, 1991; Hulten et *al.,* 1996). In general, the rate of infection decreases with improving socioeconomic conditions, a relationship that reflects changes in lifestyle that influence the acquisition of the bacterium. The prevalence of infection is therefore usually low in industrialized countries compared to non-industrialized countries, contrary to the results found in our study (Forman et *al.,* 1990). Our result is in agreement with other studies conducted in developed and developing countries. Like the one done in Palestine on risk factors for *H. pylori* infection, they found that the type of water consumed during childhood could be considered a risk factor (Parsonnet et *al.*, 1998). Positive results were high in subjects who consumed municipal or well water during childhood, 53.2% prevalence while subjects who consumed filtered (purified) water during childhood had 16.7% prevalence, however, sources of drinking water in adulthood did not affect positive outcomes (Elmanama et *al.,* 2008), these findings are confirmed by Mahalanabis et al. (1996) which deduced that water was one of the reasons favoring infection by *H. pylori*). According to Maherzi et *al.* (2003), the prevalence of *H. pylori* varies according to geographical regions, poor hygiene conditions, water sources, community life, which are all risk factors favoring infection.

H. pylori infection has become the unavoidable etiological factor of many gastric diseases, the data obtained in our study indicate that 268 cases (31.5%) presented with gastritis, 168 cases (19.07%) had ulcers, 253 cases (29.7%) with gastric cancer and 2 cases (0.2%) with MALT lymphoma and 18.82% included d other pathologies linked to *H. pylori* such as: bulbitis (34), antritis (119) and stenosis (5). According to the study conducted by Essadik et *al.* (2013) on *H. pylori* infection in Morocco which spread over 13 years (1998-2011), 837 patients with gastric pathologies, they found that these patients all have gastric disorders at different levels of l stomach, 718 patients (85.8%) suffer from gastritis, 55 patients (6.6%) are carriers of ulcers and 64 patients (7.6%) are affected by gastric cancers. By comparing these results with those obtained in our study, the prevalence of gastritis is lower. On the other hand, the prevalence of ulcers and gastric cancers are higher. Joutei et *al.* (2010) studied the responsibility of *H. pylori* infection in the context of certain pathologies, the analysis of their results revealed that 92% of the population studied was infected with chronic gastritis. About gastric ulcer, its frequency was 5% while gastric cancer was observed in 3% of the population studied. By examining our results, we found that the prevalence of the pathologies studied is high compared to the latter.

Another study by Andoulo et *al.* (2013) on a population of 171 patients at the Yaoundé Hospital and University Center and at the Cathedral Medical Center in Cameroon for presenting symptoms of a gastroduodenal pathology show that the prevalence of infection with *H. pylori* was 72.5%, the main lesions found among the patients were antral gastritis 49.7%, diffuse gastritis 29.8%, duodenal ulcer 15.8%. Gastric cancer was relatively rare in patients, these results do not agree with those of our study whose prevalence of pathologies is higher than the Cameroonian study.

The study carried out by Attaf et *al.* (2004) in Morocco on 3619 patients presented gastroduodenal signs demonstrates that the prevalence of *H. pylori* infection is 95.56% in the case of chronic non-atrophic gastritis and 88.06% in the case of chronic atrophic gastritis. The prevalence of *H. pylori* infection is 67.14% in the case of gastric adenocarcinoma and 68.75% in the case of lymphoma (EL Bir Izem, 1998) and this contradicts our study due to increased prevalence of gastritis and gastric cancer.

CONCLUSION

At the end of our study, we can conclude that the knowledge of the factors affecting the prevalence of this infection can better define patients infected with *H. pylori* who are at high risk, and thus allow a more targeted approach to prevent this infection. In this context, we recommend carrying out other studies on more representative samples in Algeria, deepening research on the incidence of the infection in order to understand the factors favoring its transmission and focusing on research on the traditional phytotherapy and to translate this knowledge in order to enhance its therapeutic virtues.

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