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Serological Diagnosis and Epidemiological impact of *Helicobacter pylori* infection on human health in Diyala Governorate, Iraq

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ABSTRACT

Helicobacter pylori (*H. pylori*) is one of the most common bacterial stomach infections and is implicated in a majority of stomach and duodenum ulcer as well as gastric cancer. The study showed that the incidence in Diyala is nearly high comparing with the surrounding, little known about *H. pylori* prevalence in this population or other Native communities. In this cross-sectional study aimed to determine the prevalence of *H. pylori* among people subjects of different age groups ranged between 1 year to >50 years old. Two hundred and fifty of blood samples were collected from patients admitted Teaching hospitals in Baqubah city and subjected to serological screening test. The results revealed that the prevalence of *H. pylori* antibody in human blood samples were 75.2%. The results appeared that *H. pylori* in males were more than females as rate was 78% among males compared to females' infection rate was 70%. The study also showed that the high prevalence rate of *H. pylori* antibody in the blood of patient's age group 31-40 years was (77.8%), followed by the age group of 41-50 years (76.2%). Regarding risk factors, smoker males were the most infected with *H. pylori* (78.4%) compared to smoker females (31.7%). The results concluded that, the seroprevalence of *H. pylori* among human in Diyala Governorate was very high, and the infection occurred at all ages, particularly in the young people ages.

1. Introduction

The genus *Helicobacter* belongs to the ϵ subdivision of the Proteobacteria, order Campylobacterales, family Helicobacteraceae. To date, The genus *Helicobacter* comprises of 32 validly published species and *Helicobacter pylori* is the prototype species. Its helical shape (from which the genus name derives) is thought to have evolved to penetrate the mucoid lining of the stomach. It is also highly motile due to the presence of multiple flagella at the end of the cell. *Helicobacter* are all microaerophilic organisms, and many but not all species are urease positive, also in most cases are catalase and oxidase positive [1,2].

In general, the genus *Helicobacter* is classified into two groups: the gastric *Helicobacter* species, which colonize the stomachs of different mammals including humans, while the remaining species,

referred to as non-gastric or enterohepatic species (EHS), are commonly found in other animals such as mice, rats, rodents, and hamsters. *Helicobacteraceae* species have organ specificity in which gastric species are incapable of colonizing the lower intestines and vice versa [3,4].

For a long time, human stomach was considered inhabitable environment for microbes mostly due to the harsh acidic conditions. It is found beneath the mucus layer of gastric epithelial cells and the overlying gastric mucin, which is a highly specialized niche. *Helicobacter* spp. are the only known bacteria that can thrive in stomach environment owing its urease enzyme that hydrolyzes urea to carbon dioxide and ammonia, which in turn lowers stomach acidity and enables survival of the bacterium. Currently, the

oral cavity is also considered to be an appropriate habitat for *H. pylori* survival [5,6].

H. pylori are quite a frequent infection all over the world, the researchers [7] stated that the *H. pylori* is strongly associated with gastritis, duodenal ulcer, gastric carcinoma and mucosa-associated lymphoid malignancies [8,9,10].

The occurrence of *Helicobacter pylori* infection is still high globally. It was estimated in 2015 that 4.4 billion individuals are infected with *H. pylori*, more than 80% of cases are asymptomatic [11,12]. The prevalence of *H. pylori* infections varies greatly from 7.3% to 92.0% since it is influenced by age, socioeconomic status, and geographical location. It is believed that the infection is acquired during the childhood, especially in crowded families. Additionally, higher prevalence exists in regions of inadequate sanitation and contaminated water such as rural areas [13,14,15].

The prevalence of *H. pylori* infection in Diyala is less investigated, therefore the objectives of this study were to study the seroprevalence of *H. pylori* infection among people in Diyala Governorate, and to determine the prevalence of *H. pylori* in humans during the months of study.

2. Material and Methods

2.1. Study Design and participate

A cross-sectional study was conducted from November 2020 to January 2021. Two hundred and

fifty of human blood samples including 160 males and 90 females were collected from patients admitted to Teaching hospital in Baqubaa city. The samples were collected from patients with ages ranged from one 1year to more than 51 years. A 5ml blood sample was collected from every patient into vacutainer tube without anticoagulant. Collected blood were allowed to clot and transported in a sterile container to the laboratory, the blood centrifuged, and serum was separated for detection of *H. pylori* antibodies.

2.2. Personal information

Personal data were recorded, including gender, age, and residence site.

2.3. Detection of *H. pylori* antibodies in the blood

Laboratory detection of *H. pylori* antibodies in blood samples was carried out using *H. pylori* antibody test card *H. pylori* Ab combo rapid test (device kit). The test was performed according to the previously published protocol [16].

3. Results

Prevalence of *H. pylori* according to gender

The total prevalence of *H. pylori* in human blood was 188/250 (75.2%) (Table 1), The male is more exposed to infection with *H. pylori* than female (125/160 (78.1%), 63/90 (70.0%), respectively). However, there are negative samples for both male and female (35/160, (21.18%), 27/90, (30%), respectively)

Table 1: Prevalence of *H. pylori* according to gender

Gender	samples	Positive Samples		Negative Samples	
		No	%	No	%
Male	160	125	78.1	35	21.18
Female	90	63	70.0	27	30
Total	250	188	75.2	62	24.8

Prevalence of *H. pylori* according to age

This study showed that samples collected from patient with ages ranged from 1 to more than 50 years, the highest rate of *H. pylori* antibodies were at

ages (31-50) years at (77.8 and 76.2)% respectively while the lowest rate were at (1-10) years at (71.4)%, as appeared in Table 2.

Table 2: Distribution of *H. pylori* according to age of the patients

Age	No. samples	Positive Samples (have <i>H. pylori</i>)		Negative Samples (no <i>H. pylori</i>)	
		No.	%	No.	%
1-10	28	20	71.4	8	28.6
11-20	40	30	75	10	25
21-30	48	36	75	12	25
31-40	36	28	77.8	8	22.2
41-50	42	32	76.2	10	23.8
>50	56	42	75	14	25
Total	250	188	75.2	62	24.8

Prevalence of *H. pylori* according to residency

According to the residence area, higher prevalence rate was observed among subjects of urban area (73.4%), whereas 26.6% of screened subjects were indwelling rural area (Table 3).

Table 3: Distribution of *H. pylori* according to according to residence.

Residence	Positive Samples (have <i>H. pylori</i>)	
	No.	%
Rural	50	26.6
Urban	138	73.4
Total	188	100

Prevalence of *H. pylori* according to smoking

The total prevalence of *H. pylori* in participants who were smoker was 62.8% (Table 4). It was also

noticed that the smoker males were more infected (78.4%) than smoker females (31.7%).

Table 4: Prevalence of *H. pylori* antibody in Human according to smoking.

Smoking	No. of positive samples	Smokers		Non-smokers	
		No.	%	No.	%
Male	125	98	78.4	27	21.6
Female	63	20	31.7	43	68.3
Total	188	118	62.8	70	37.2

Discussion

The overall prevalence of *H. pylori* antibodies in total patients' samples were 75.2% (188/250) (Table 1), the high incidence of *H. pylori* infection in early adult life can possibly be explained by the exposure to *H. pylori* in early life while the most crucial risk factors are exerting their effects (i.e. bad hygiene, living in crowded families, and lack of proper sanitation). The WHO identified water source as a primary environmental or domestic risk factor for infection. While uncertainty remains regarding mode of transmission, analysis indicated *H. pylori* may be spread person-to person through a fecal-oral route [17], potentially via contaminated water sources. *H. pylori* has been shown to survive in drinking water [18] and sources positive for *H. pylori* have been associated with clinical symptoms [19] and an increased rate of colonization [20]. The current results is in agreement with the researcher [21] in Saudi Arabia who found the prevalence of *H. pylori* infection to be 75%, as well as [22] mentioned The prevalence of *H. pylori* infection appears to have decreased over time in China, while it has stabilized in the USA. Urbanization may reduce the prevalence of *H. pylori* infection.

The prevalence of *H. pylori* in Diyala Governorate showed a less rate compared to that reported from other studies in some developing nearby countries. For instance, [23] in Jordan reported a seroprevalence of 82%. Our results are slightly higher than the result confirmed by (24) in Egypt where the seroprevalence of *H. pylori* infection was 60%. Locally.

In the present study, it was noticed that males were more infected (78.1%) than females (70.0%). This observation is in agreement with the research [25], where the researcher indicated the seroprevalence was higher in male in Erbil (44.15%) and female (32.85%) and [26] in Egypt, they found the rate of infection in female and male was 52.0% and 48.0%, respectively. Furthermore, [27], his studies indicated, the prevalence of *H. pylori* was slightly higher in males than females (38.4% vs 36.7%). In contrast, in Turkey documented that females were more infected (76.2%) than males (23.8%) based on monoclonal *H. pylori* stool antigen test. The findings of higher prevalence rates among subjects older than 31 years old (Table2) are disagree with result reported by the researcher [28], in which 43.7% of the *H. pylori* infections were found in subject with age from 20 years or younger. This study had limitations. First,

sample size was small and community samples were limited to one region of Baqubaa city, which could limit generalizability of results. Second, *H. pylori* infection and colonization can persist throughout an individual's lifetime. It is likely that adults in this study acquired *H. pylori* in childhood or at an earlier time point. Therefore, risk factors identified in this study may not accurately reflect social, environmental, or clinical conditions that immediately preceded acquisition of *H. pylori* infection. The estimated prevalence of *H. pylori* in this study include individuals under the age of 20, which could overestimate the prevalence of *H. pylori* infection in this target population. Previous study found the infection was 46.8% of individuals with age range of 21-23 years, and only 9.5% of subjects elder than 24 years. Similarly, the results are also contradicting the findings of , in Islamabad (Pakistan), where they reported a prevalence rate was 73.6 % in 3-8 years' age group, 74.4 % in 8-12 years' age group and 60.4% in children between 12-16 years of age. Additionally, [29] in Oman had found an increase in overall prevalence of *H.pylori* among children from 7% in young children (< 5 year-old), to 33% in those aged between 5 and 10 years. In general, there is an age-related increase in prevalence of *H. pylori*, especially in the developed countries. It is widely believed that the infection occurs during childhood rate of *H. pylori* acquisition has dropped with improved hygiene practices and conditions as well as the wide use of antibiotic [30].

According to the habitation sites, it was observed that in urban and rural area the prevalence of *H. pylori* antibodies among people rates were 73.4% and 26.6% respectively (Table3). These observations indicate that *H. pylori* infections are common in both areas. In order to smoking (Table4) the prevalence increased in smoker males (78.4%) compared to non-smoker males (21.6%), while the prevalence in smoker female was (31.7%) compared with non-smoker females (68.3%). Smokers are more likely to develop peptic ulcers. Ulcers are painful sores in the lining of the stomach or the beginning of the small intestine. Ulcers are more likely to heal if you stop smoking. Smoking also raises the risk for infection from *Helicobacter pylori*. This is bacteria commonly found in ulcers. The mechanisms proposed to explain the role of smoking in these disorders include mucosal damage, changes in gut irrigation, and impaired mucosal immune response. Paradoxically,

cigarette smoking is a protective factor for the development and progression of ulcerative colitis (UC). UC and CD represent the two most important conditions of inflammatory bowel diseases, and share several clinical features. The opposite effects of smoking on these two conditions have been a topic of great interest in the last 30 years, and has not yet been clarified [31].

Conclusion

The high incidence of *H. pylori* infection in early adult life can possibly be explained by the exposure to *H. pylori* in early life while the most crucial risk

factors are exerting their effects (i.e. bad hygiene, living in crowded families, and lack of proper sanitation). Additionally, increased susceptibility because of a genetic predisposition may also play pivotal roles. Due to the importance of this study, further researches and studies on *H. pylori* in different governorates around Diyala should be carried out. This study also recommends all people especially who works in field of food preservation and food service either in household or that working in restaurants to follow the keys recommendations published by WHO to provide safer food.

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التشخيص المصلي والتأثير الوبائي لعدوى الملوية البوابية على صحة الإنسان في

محافظة ديالى - العراق

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الملخص

تعد الملوية البوابية (*Helicobacter. pylori*) من أحدى أكثر الأصابات المعدية البكتيرية شيوعاً والمسببة في الغالب قرحة المعدة والأنتي عشر وكذلك سرطان المعدة. أظهرت الدراسة أن معدل الإصابة بالبكتيريا الملوية البوابية في ديالى مرتفع تقريباً مقارنة بالمناطق المحيطة، والتي لا يُعرف عنها الكثير عن أنتشار الملوية البوابية في هذه المجموعة السكانية. هدفت هذه الدراسة إلى تحديد مدى أنتشار بكتيريا الملوية البوابية بين الأشخاص من مختلف الفئات العمرية الذين تتراوح أعمارهم بين 1 سنة إلى < 50 سنة. تم جمع مائتين وخمسين عينة دم من مرضى داخل المستشفيات التعليمية في مدينة بعقوبة وأخضعوا لفحص مصلي. أشارت النتائج أن نسبة أنتشار الأجسام المضادة لبكتيريا الملوية البوابية في عينات دم الإنسان بلغت 75.2%. و نتائج الإصابة بالبكتيريا الملوية في الذكور كانت أكثر إصابة من الإناث حيث بلغت نسبة الإصابة عند الذكور 78.1% مقارنة بالإناث 70%. كما أظهرت الدراسة أن ارتفاع معدل أنتشار الأجسام المضادة للبكتيريا في دم المريض من الفئة العمرية 31-40 سنة كان (77.8%)، تليها الفئة العمرية 41-50 سنة (76.2%). فيما يتعلق بعوامل الخطر، لدى الرجال المدخنون الأكثر إصابة بالبكتيريا (78.4%) مقارنة بالإناث المدخنات (31.7%). بالإضافة إلى أن معدل أنتشار المصلي للبكتيريا البوابية بين السكان في محافظة ديالى كان مرتفعاً جداً وتحدث الإصابة في جميع الأعمار وخاصة في سن الشباب.