The Effect of the Presence of *Helicobacter Pylori* Bacteria to All Kinds of Blood Components

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Abstract

Helicobacter pylori is a gram-negative, micro-aerobic, spiral-shaped bacteria which is considered one of the main factors that lead to stomach disorders such as gastric atrophy, stomach cancer, chronic gastritis, and peptic ulcers. The present study was carried out in Nineveh Governorate, Iraq. The sample of the study included 325 participants. After conducting a series of tests to detect whether *H. pylori* infection is positive among the participants, it has been shown that the number of infected participants were150 (48 males and 102 females), then complete Blood Counts test have been done in order to investigate the relationship between the Component Blood Count and the infection of *H. pylori*.

Based on the results, it is concluded that *H. pylori* infection is more prevalent in females. Also, the percentage of infection decreases in ages over 60 years and in children less than 15 years. Moreover, it is revealed that the incidence of *H. pylori* infection increases in people with blood type A. Finally, the study doesn't show any effect of smoking on the increased risk of infection with *H. pylori*.

In this study, the infected patients with *H. pylori* recorded an increase in WBCs equal to 24%, while lymphocyte counts didn't record any changes, RBCs were increased by 12%, some infected patients had fluctuations of increase and decrease in the level of Hb, the figures were between 8% and 24%, respectively, the increase in the platelet count was 12%, and the decrease was 4%. Hence, there are significant differences in the relationship between infection with *H. pylori* and other factors such as; gender, age, WBCs, lymphocyte counts, RBCs, Hb, and platelet counts in the infected group at $P \leq 0.05$.

Keywords: *H. pylori,* Hb, WBCs, RBCs, Nineveh Governorate.

تأثير تواجد بكتريا *Helicobacter pylori* على المكونات الدموية بأنواعها المختلفة

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جامعة الموصل / كلية التربية الاساسية / قسم العلوم العامة

الخلاصة

البكتريا الحلزونية البوابية سالبة لصبغة كرام، قليلة الهوائية وتعتبر واحدة من مسببات الامراض الرئيسية لاضطرابات المعدة ، سرطان المعدة، قرحة المعدة والتهاب المعدة المزمن.

اجريت الدراسة الحالية في محافظة نينوى ـ العراق ،شملت الدراسة ٣٢٥ مشارك ،وبعد اجراء سلسلة الفحوصات للكشف عن الاصابة بعدوى *H. pylori* ، بلغ عدد المصابين ١٥٠(٤٨ ذكر، ١٠٢انثى) وايضا اجريت اختبارات تعداد الدم الكاملة من اجل التحقق من العلاقة بين اعداد مكونات الدم وعدوى *H. pylori*.

تضمنت نتائج الدراسة ان عدوى *H. pylori* اكثر انتشار بين الاناث، كما ان خطر الاصابة بهذا النوع من البكتريا ينخفض في الاعمار فوق ٦٠ عاما والاطفال الاقل من ١٥ عاما، وتزداد الاصابة في الاشخاص الحاملين لفصيلة الدم A ولم تظهر الدراسة اي تأثير للتدخين على زيادة خطر الاصابة بعدوى *H. pylori*.

سجل المصابون زيادة في تعداد كريات الدم البيضاء بنسبة ٢٤٪، بينما لم يسجل عدد الخلايا اللمفاوية اي تغيرات، وازداد عدد كريات الدم الحمراء بنسبة ١٢٪ اما التغير في مستوى الهيموكلوبين سجل زيادة ونقصان بنسبة ٨٪و ٢٤٪على التوالي، وكانت الزيادة في عدد الصفائح ١٢٪ والنقصان ٤٪، وفي هذه الدراسة توجد فروق معنوية بين الاصابة بعدوى *H. pylori* وعوامل اخرى مثل الجنس ،العمر، كريات الدم البيضاء ، الخلايا اللمفاوية، كريات الدم الحمراء، الهيموكلوبين والصفائح الدموية عند $P \leq 0.05$.

الكلمات المفتاحية: الحلزونية البوابية، الهيموكلوبين، كريات الدم البيضاء، كريات الدم الحمراء، محافظة نينوى.

Introduction

Helicobacter pylori is known like a spiral shape, gram-negative and micro aerobic (Guo *et al*., 2021; Nejati *et al*., 2018), dimensioned as 0.5 to 1 µm wide, 2 to 4 µm long, described as a short helical S-shaped microorganism (Öztekin *et al*., 2021), with from 3 to 5 polar flagella which deliver motility, has catalase, urease, and oxidase enzyme (Piscione *et al*.,2021).

This type of bacteria was discovered by Giulio Bizzozero in 1892 in the stomach of dogs, and it was described as a spiral microorganism, and because of its spiral shape, it was called *Campylobacter pyloridis* by Barry Marshall and Robin Warren in 1983, later in 1989 it was renamed to "*Helicobacter pylori*" by (Öztekin *et al*, 2021). *H. pylori* considered as one of the key reasons for gastric disorders such as peptic ulcer, chronic gastritis, gastric atrophy, and gastric cancer (Karbalaei & Keikha, 2020).

In previous years, the common belief that the stomach is representing an unsuitable environment for the development of microorganisms until finding the relationship between gastric cancer and *H. pylori* in 1991 and 1994, then this is were confirmed in 2009 relied on the epidemiological data. In the USA, national and

international agency for cancer research have stated that *H. pylori* is cause peptic ulcer disease and cancer in humans   (Öztekin *et al*, 2021; Piscione *et al*, 2021).

During advancement of molecular skills, scientists revealed the presence of copiousness numbers of microorganisms in the stomach, also several evidences has confirmed the activity of bacteria in the stomach and their role in the progression of gastric diseases(Öztekin *et al*, 2021; Piscione *et al*, 2021).

A great number of *H. pylori*-infected individuals don't suffer any symptoms, therefore has been shown that peptic ulcer diseases are observed in 15 - 20% and also gastric cancer 1- 2% of individuals. Wu *et al*., 2021 have pointed out that more than 50% of the populations in the world are infected with *H. pylori*.

H. pylori has several factors which enable it for resisting a pH of 2.0 and could survive in the gastric environment (Piscione *et al*., 2021; Nejati *et al*., 2018; Keikha, 2020).

H. pylori lives in the lower section of the stomach, with the help of it's spiral shape and flagella, it enters the mucous layer of the stomach, the function of *H. pylori* is to hydrolyses urea into ammonia and carbon dioxide with the urease enzyme   that produces it (Öztekin *et al*., 2021) and thus an increase in stomach acidity and damage to the mucous layer, in addition to that the *H. pylori* has a vacuole-forming cytotoxin (VacA) which contributes to the formation of a gap and adhesion in the stomach wall by adhesive proteins (Öztekin *et al*., 2021; Guo *et al*., 2021).

The vacuole-forming cytotoxin causes host cell death through pore formation and cell death in the mitochondria membranes, and the VacA-cytotoxin-associated antigen (CagA) is in charge of gastric cancer and gastric ulcer(Öztekin *et al*., 2021; Guo *et al*., 2021).

In the outer membrane of *H. pylori*, there are a group of proteins called adhesive proteins: BabA, HopQ, LabA, and SabA (Stowell & Stowell, 2019), (Öztekin *et al*., 2021) pointed to that the common cause of infection with *H. pylori* is precisely the fecal-oral or oral-oral methods through the consumption of contaminated water and food.

Epidemiological studies propose that *H. pylori* is related to some of non-gastrointestinal illnesses for example prostatitis, autoimmune thyroid, myocardial infarction, hepatic encephalopathy, severe coronary and psoriasis, in addition, it is blamable for lack of iron, fetal abnormality, thrombocytopenia, anemia and fetal growth obstruction in pregnancy, though the infection caused by *H. pylori* is linked with a defensive factors for example; IBD, esophageal cancer, bone osteoporosis and asthmatic cases, Likewise with respect to children, specifically infants the infection has been accompanying with underfeeding and long term diarrhea (Mehata *et al*., 2021; Raafat *et al*., 2019; Frost *et al*., 2019).

Recently, some researchers have established that *H. pylori* infection is related to the frequency of acne rosacea, therefore its logical to assume that similar treatment for *H. pylori* disease can be used as a healing method to cure acne rosacea (Yang,2018).

(Sohouli *et al.*, 2020) have confirmed in their study that patients with *H. pylori* infection can increase risk of cancer such as; lymphoma, pancreas disease and atherosclerosis.

(Ari *et al*., 2019) have shown in their study to isolates *H. pylori* from cholecystectomy samples found it in 40% of patients without gallstones and 20% of those with gallstones, The previous information revealed that *H. pylori* infection may worsen serum lipid levels through continuing chronic inflammation (Iwai *et al*., 2019).

The aim of this study is to shed light on the changing of blood components associated with infection by *H. pylori*, in addition to encouraging to diagnosis and treat the bacteria in the early stages of the disease in order to avoid the development of infection.

Material and methods

1-Area Study

This study was conducted in Nineveh Governorate, Mosul, Iraq. with distinctive features consist of multi-culture society including (ethnicity, tribes, education, economic, social, and scientific) background as well as to different health awareness among its residents.

2- Participants volunteers in the study

A total of 325 participants were involved; 150 of them were infected with *H. pylori* aged between (4-74) years old including 48 males, 102 females while the rest remain 175 participants of non-infected with *H. pylori* aged between 4-74 years old including 55 males and 120 females.

The samples have been collected during the period from April to November 2021, all the necessary tests have been carried out after the diagnosis of *H. pylori*.

3- Determination of *H. pylori* infection

Blood samples have been taken from all participants in the study via a syringe after sterilizing of the area by ethanol with 70% concentration, place the sample in the test tube and leave it for a while in order to the blood to be coagulated, then the tubes in centrifuged at 300 rpm speed in order to obtain to the serum. Anti-bodies such as *H. pylori* can be detected in two ways either by using chorus Trio device, Italia, 2010 or by using *H. pylori* Ab Combo.

Note: antibodies type (IgM) indicates a recent infection, and the antibodies type (IgG) indicates an old infection.

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4- Determining of the Blood type.

Determine the blood type by using Blood Group kit, to place 3 drops of blood on glass slide: the first drop mixes with Anti A reagent of Antigen A, the second drop mixes with Anti B reagent of Antigen B and the third drop mixes with Anti D reagent of Antigen D, then read the results (the United Kingdom,2021).

5- Complete Blood Counts

3 ml of blood taken from each participant in the study by using a syringe after sterilizing the area by ethanol with 70% concentration then pour the sample into a test tube containing an Ethylene diamine tetraacetic acid (EDTA), after the necessary procedure, the sample is read by a device (Swelab Alfa Plus) to obtain the number of red blood cells(RBC), white blood cells(WBC), platelets(PLT), and hemoglobin(Hb)(Sweden, 2017).

6-Statistical analysis

The data were analyzed by using SPSS version 26, p value was determined by using chi-square test.

Results and discussion

Table 1: The relationship between *H. pylori* infection and gender.

Gender	Patients		Control	
	Male	**Female**	**Male**	**Female**
Number	48	102	55	120
Percentage	32%	68%	31.43%	68.57%
P-value	0.000*		0.000*	

* Indicates that there are significant differences using the chi-square at $P \leq 0.05$.

Globally, the spread of *H. pylori* is affected by several factors, including geographic location, age, gender, ethnicity, and economic and social status (Allagoa *et al*., 2018).

The common belief that the *H. pylori* has originated in East Africa 58,000 years ago and then spread to other countries, (Linz *et al*., 2007), It has also been found that the *H. pylori* infection among USA and UK people were 27.1% and 13.4% respectively (Wang *et al*., 2019).

In 2018, Zamani *et al*. have piloted a study in 73 countries, the researchers found that the *H. pylori* infection rate in developing countries are 50.8% and in industrial countries 34.7%, the rate of *H. pylori* infection in females is 42.7%, and in males

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46.3%, this contradicted to present outcome research the females recorded 68% and 32% in males among 150 infected with *H. pylori* and the ratio of females was 68.57%, males 31.43% among 175 non-infected, When performing statistical analysis for infected group and non-infected group, It was noticed that there were significant differences between gender and *H. pylori* infection at probability-level P ≤ 0.05(table 1).

In another hand, that the results in the present study show the rate of infection with *H. pylori* in females are higher than in males, and this has been confirmed by (Abo-Amer *et al*., 2020) in their study the infection rate was 55% in females while in males was 45% among 646 patients, Again, there are more studies agree with present study such as (Sgambato *et al*., 2018) their results showed that the infection rate in females was higher than males, the total patients were 161.

Table 2:The relationship between *H. pylori* infection and age – gender.

Age gender	Patients							Control						
	4 - 14	15-24	25-34	35-44	45-54	55-64	65-74	4 -14	15-24	25-34	35-44	45-54	55-64	65-74
Female	6	30	30	6	12	12	6	20	20	15	15	15	15	20
Male	6	0	0	24	18	0	0	5	5	10	10	10	10	5
Total	12 (8%)	30 (20%)	30 (20%)	30 (20%)	30 (20%)	12 (8%)	6 (4%)	25 14.28%	25 14.28%	25 14.28%	25 14.28%	25 14.28%	25 14.28%	25 14.28%
P-value	0.000*							0.000*						

* Indicates that there are significant differences using the chi-square at P ≤ 0.05.

In the present study, the results confirm 150 people have been infected among 325 people in total were have been involved in the study, their ages group varied between 4-74 years old. In comparison between infected and none infected people with respect to their age group, the outcome shows that the least infected people were among 65-74 years old were 4%, while most infected people were among 15-54 years old reached 20%, the middle infection rate were 8% for both age groups of 4-14 and 55-64 years old.

When performing statistical analysis, the present results show significant differences between age and *H. pylori* infection for infected group and non-infected group at P ≤ 0.05, as shown above in table 2, The present results are consistent with the study carried out in North-eastern Brazil, in which the researchers found that 120 infected among 200 participants aged 18-≥60, the ratio of infected people were 38.3% in aged 40-59 while it is 12.5% in aged over 60 years (Basílio *et al*. al., 2018).

Another study conducted by (Lu *et al*., 2020), the total 1690 participants were involved aged between 15 and 86 years old, the highest rate of infection was 56.5% in aged 15-44 years old while recorded 43.5% in aged 45-86 years.

In Iraq – town of Kirkuk, the researchers (Mohammad & Salih, 2019) noticed in their study on 176 participants aged 15-74 years, the rate of least infected people was 5.8% in aged 65-74, and the highest rate of infected was 35.8% in aged 53-44.

Apparently, the age factor is dominant in the spreading the infection of *H. pylori*, for example in the United States, the infection among 60 years and older reaches 50%, While in children reaches 10% only (Piscione *et al*., 2021).

Table 3: The relationship between *H. pylori* infection and blood group.

Blood groups	Blood type A	Blood type B	Blood type AB	Blood type O
No. of patients/ Percentage	54 (36%)	30(20%)	36(24%)	30(20%)

The ABO "blood group system" play an important role in human blood transfusion processes. This system is orderly by the ABO gene that changes the carbohydrate content of red blood cell antigens(Khosravi *et al*., 2021), The ABO gene located on chromosome 9q34 encrypts a glycosyltransferase that catalyzes the transfer of nucleotide sugars to the H antigen and arranges the production of ABO blood group antigens(Khosravi *et al*., 2021).

H. pylori own lipopolysaccharides on its outer membrane as well as blood group antigen-binding adhesion A (BabA adhesion) which causes adhesion of *H. pylori* to the gastric epithelium and allows persistent colonization(Mohammad & Salih, 2019).

In this study, the data available to date shows that the blood group type A recorded percentage of 36%, while AB24%, B 20%, and O 20% as shown in table (3), In another word that the blood type A is more likely to be infected with *H. pylori*, this agrees with a study carried out by (Konur *et al*.,2020), the study carried out on 104 patients and the average age (47.7±14.6)year, the distribution of blood group was A (47.1%), B (12.5%), O (8.7%) and AB (31.7%).

The current result differs from the result achieved by (Christian *et al*., 2019), in their study the total of patients 103, and the blood groups distribution were as follows; O (55.3%), A (22.3%), B (13.6%) and AB (8.7%) therefore O blood group are more prone to *H. pylori* infection.

Table 4:The relationship between *H. pylori* infection and smoking.

Status	Smoker	Non- smoker
No. of patients/ Percentage	١٠٨(72%)	٤٢(28%)

In general, It has been found that some risk factors linked to the infected with *H. pylori* such as, the association between smoking and infected with *H. pylori*(Ogihara *et al*., 2000).

The current study found that smokers constitute the largest percentage for infecting with *H. pylori*, as been shown in (table 4), the smokers are (72%) and nonsmokers are (28%) among 150 patients, i.e. the smokers are more likely to be infected with *H. pylori* than nonsmokers, these results show disagreement with the study conducted by (Basílio *et al*., 2018) showing that smokers are 15% and nonsmokers are 61.7% among 120 patients.

(Wang *et al*., 2019)suggested that smokers are more likely to be infected than nonsmokers which agrees with the present study, this study carried out in China.

In a study carried out in north-eastern Iran on stomach cancer patients caused by *H. pylori*, the results show that smokers are 24% against 76% for nonsmokers of 469 patients(Esmaeilzadeh *et al*., 2021).

Scientists in Italy ran pilot of study on *H. pylori* patients at two different periods in 2009-2014 they found that the smokers are 22% and nonsmokers are 78%, the total of patients was 907, in 2015-2019 the results show reduction infected of smoker pateints 21.4% smoker and 78.6% nonsmoker of the total 739 patients (Saracino *et al*.,2020).

Table 5:The relationship between *H. pylori* infection and White Blood Cell counts.

Gender	Patients		Control	
	WBC>10*10^9/L	WBC 3.5 - 10*10^9/L	WBC>10*10^9/L	WBC 3.5 - 10*10^9/L
No. of Male/ Percentage	18(12%)	30(20%)	10(5.71%)	45(25.71%)
No. of Female/ Percentage	18(12%)	84(56%)	30(17.14%)	90(51.43%)
Total/	36(24%)	114(76%)	40(22.86%)	135(77.14%)
P-value	0.008*		0.319	

* Indicates that there are significant differences using the chi-square at P ≤ 0.05.

White blood cells include five types: Lymphocytes, Monocytes, Eosinophils, Basophils, and Neutrophils (Kutlu *et al*.,2020).

White blood cells play an important role in the immune system by protecting the body from parasitic, bacterial, viruses, and fungi infections. Many diseases such as AIDS and leukemia can be diagnosed from the number of white blood cells, so the total number of white blood cells gives a reflection of the health status (Kutlu *et al*.,2020), Because of the immune role played by WBCs, the researchers (Iwai *et al*., 2019) have revealed that infection of *H. pylori* causes an increase in the number of WBCs in proportion to the severity of the infection, It's also noted that after treatment and eradication of *H. pylori* the number of WBCs clearly reduced.

H. pylori infection can causes growing production of reactive oxygen metabolites therefore in most cases causes DNA damage, then changes occurs on oncogenes and tumor suppressors as can be seen in case of gastric cancer, the total WBC count could reflect the extent of mucosal irritation induced by *H. pylori* infection(Wang *et al*.,2018).

In the present study comparison between the non-infected and infected group in terms of number of WBCs, in the infected group the increase in the number of WBCs was 24% while in the non-infected group were 22%. in addition, the present results does not show any reduction in the number of WBCs, i.e. the infection of *H. pylori* occurs only in case of increase in number of WBCs.

When statistical analysis performed on the results, there were a significant differences in relationship between white blood cell counts and *H. pylori* infection in the infected group at $P \leq 0.05$, in another hand there was no significant differences in behavior between white blood cell counts and *H. pylori* infection in the non-infected group as shown in table 5. These results are in agreement with the study carried out in northeastern Taiwan between 2013-2019 by (Chen *et al*., 2021) which revealed that after treatment of infected with *H. pylori*, the values of WBC and cholesterol have been reduced.

(Wang *et al*, 2018) conducted a research study between 2007 -2016 in Jiangsu hospital in China, covered 104 participants, the purpose of this study to know the relationship between WBCs count and gastric cancer caused by *H. pylori*, the results showed both cases of increase and decrease of WBC counts, in case of WBCs increases, in male were 41.3% while in female 8.7%, In case of decreases of WBC counts in male was 32.7% and female 17.3%.

Current study does not agree with the study conducted in Sudan which included a comparison between non-infected and the infected group with *H. pylori* in terms of the number of WBCs., the infected group recorded an increase of WBCs 3.7% among 80 infected participants, while the non-infected group recorded 2% increase of WBCs among 50 non-infected participants, the ratio of decrease of WBCs was 4% in the infected group and 11.3% in non-infected group (Elkhalifa *et al*.,2021).

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Another study of 140 children of different aged groups in Nigeria which suffering from abdominal pain or vomiting, the result was 45.7% infected with *H. pylori* of them 3.1% had decreased of WBCs count and 12.5% increased WBCs count(Akhimienho *et al*., 2021).

Table 6: The relationship between *H. pylori* and Lymphocyte counts.

Gender	Patients			Control		
	lymphocyte>5 $*10^9$/L	lymphocyte<0.9 $*10^9$/L	Lymphocyte 0.9-5$*10^9$/L	lymphocyte>5 $*10^9$/L	lymphocyte<0.9 $*10^9$/L	Lymphocyte 0.9-5$*10^9$/L
Male	0	0	48 (32%)	0	5 (2.86%)	50 (28.57%)
Female	0	0	102 (68%)	5 (2.86%)	10 (5.71%)	105(60%)
Total	0	0	150 (100%)	5 (2.86%)	15 (8.57%)	155 (88.57%)
P-value	0.000*			0.126		

* Indicates that there are significant differences using the chi-square at P ≤ 0.05.

Lymphocytes are 7- 20 micrometers in size and they have a big nucleus, as well as they show a basic role in the immune system by affecting the immune reactions to microorganisms and foreign substances, In addition, they cause organ rejection in organ transplants because they consider the transplanted organ as a foreign body (Orakpoghenor *et al*., 2019).

Continuous infection with *H. pylori* leads to inflammation and thus lymphocytes will across into the stomach and stimulate the immune response, the active proliferation of type B lymphocytes leads to the creation of lymph follicles and the occurrence of stomach cancer or lymphoma in the stomach(Keikha *et al*., 2022).

In the present study, which was conducted on groups of infected and non-infected with *H. pylori*, the results didn't show any record of increase or decrease in lymphocyte counts in the infected group, there are significant differences between lymphocyte counts and *H. pylori* at p ≤ 0.05. As for the non-infected group, the ratio of an increase and a decrease in the lymphocyte counts were 2.86% and 8.57% respectively among 175 non-infected, and there aren't any significant differences between lymphocyte counts and *H. pylori* at p ≤ 0.05 as shown in table 6.

In Sudan, their study showed that lymphocytes were significantly elevated to 55% out of a total of 80 patients with *H. pylori*(Elkhalifa *et al*.,2021).

In another study carried out by (Nagata *et al*., 2015) clarify the effect of *H. pylori* on lymphocytes when comparing between infected and non-infected with *H. pylori*, The results were showing an increase in lymphocytes counts in the infected groups.

Table 7: The relationship between *H. pylori* and RBC counts.

Gender	Patients			Control		
	RBC>5.50 **10^{12}/L	RBC<3.50* 10^{12}/L	RBC3.50 - 5.50*10^{12}/L	RBC>5.50* 10^{12}/L	RBC<3.50* 10^{12}/L	RBC3.50 - 5.50*10^{12}/L
Male	18 (12%)	0	30 (20%)	25 (14.29%)	0	30 (17.14%)
Female	0	0	102 (68%)	5 (2.56%)	5 (2.56%)	110 (62.86%)
Total	18 (12%)	0	132 (88%)	3 0(17.14%)	5 (2.56%)	140 (80%)
P-value	0.000*			0.000*		

* Indicates that there are significant differences using the chi-square at P ≤ 0.05.

The Red Blood Cells (erythrocytes) have seen first under a microscope in 1658 by Jan Swammerdam(Math *et al*., 2016), formation of red blood cells is controlled by many factors, including iron, vitamin B12, folic acid, vitamin C, and erythropoietin, but the most necessary elements for the synthesis of red blood cells are B12 and iron(Haile & Timerga,2021), In addition, the main function of red blood cells is to supply oxygen to all parts of the body(Alzubaidi *et al*., 2020).

In the present study, the outcome of comparison was between the infected group and the non-infected group with *H. pylori*, the results shows an increase in red blood cell counts by 12% out of 150 infected participants, while the non-infected group recorded an increase and decrease in the red blood cell counts 17% and 2%, respectively, of the total of 175 non-infected, there are significant differences between red blood cell counts and *H. pylori* infection at p ≤ 0.05 on the infected and non-infected groups as shown in table 7, these results show disagreement with the study carried out in Ethiopia revealed that *H. pylori* causes anemia as a result of iron deficiency, as bacteria affect iron absorption, this study was conducted on 187 patients with *H. pylori*, of whom 7% suffer from low red blood cells, and this may be due to losing the blood during gastritis and the occurrence of bleeding peptic ulcer(Haile & Timerga,2021).

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(Haile & Timerga,2021) pointed that when the red blood cell counts doesn't decrease then the infection with *H. pylori* was in the early stages and didn't occur complications of infection such as bleeding from peptic ulcers.

There are many studies determined the effect of *H. pylori* on the red blood cell counts, such as the study included 173 infected and 349 non-infected with *H. pylori* among 522 participants aged between 18- 80 years. After laboratory tests for participants, the result was *H. pylori* didn't affect red blood cell counts(Guo *et al.*, 2021), In a recent study in Sudan, found out a decrease of red blood cell counts of 70% among 80 infected participants with *H. pylori*, while shows a decrease of red blood cell counts was 2% among 50 non-infected(Elkhalifa *et al.*, 2021).

(Sohail *et al.*, 2014) have conducted a study that included 90 participants who were infected with *H. pylori* (45 female, 45 male), this study confirmed that *H. pylori* doesn't affect red blood cell counts, that is mean the red blood cell counts can not be adopted as an indicator of infection with *H. pylori*.

Table 8: The relationship between *H. pylori* and Hb.

	Patients			Control		
Gender	Hb>16.5g/dL	Hb<11.5g/dL	Hb11.5-16.5g/dL	Hb>16.5g/dL	Hb<11.5g/dL	Hb11.5-16.5g/dL
Male	12(8%)	6(4%)	30(20%)	10(5.71%)	0	45(25.71%)
Female	0	30(20%)	72(48%)	0	20(11.43%)	100(57.14%)
Total	12(8%)	36(24%)	102(68%)	10(5.71%)	20(11.43%)	145(82.86%)
P-value	0.000*			0.000*		

* Indicates that there are significant differences using the chi-square at P ≤ 0.05.

Hemoglobin(Hb) is one of the blood proteins and participates in several functions, including nitrite reduction, pH regulation, keeping of redox balance, metabolic reprogramming, but the most important function that passes oxygen from the lung to all parts of the body (Eaton., 2021; Ahmed., 2020).

In the present study, the ratio of decrease in hemoglobin level was 24% while the ratio of the increase in hemoglobin level was 8% among 150 infected with *H. pylori*, in comparison with the non-infected participants the ratio of decrease in the level of hemoglobin was 11.43% and the ratio of increase in the level of hemoglobin was 5.71% among 175 participants. there are significant differences between the level of Hb and *H. pylori* infection in the infected and non-infected group at P ≤ 0.05 as seen table 8, These findings are in disagreement with the study conducted by (Elkhalifa *et al.*,2021) where the percentage of decrease in hemoglobin level was 70% among 80 infected with *H.*

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pylori, as for the non-infected, the percentage of decrease in the hemoglobin level was 58% among 50, Elkhalifa could not spot any case shown an increase in the hemoglobin level in both groups.

The researchers conducted (Quinn *et al*., 2020) a study to find out the effect of *H. pylori* on the blood components for infected persons by injecting it into six mice, After the mice infection and conducted tests, the researchers found decrease level of hemoglobin in all mice.

In another study in the city of (Sulaymaniyah - Iraq) in which only females have participated in the study in order to distinguish the effect of *H. pylori* on the body, the number of infected and non-infected with H. pylori respectively were 80 and 40, the complete Blood Counts tests have shown that hemoglobin levels decreased significantly in all patients infected with *H. pylori* compared with the non-infected groups (Rashid *et al*., 2018).

In Japan, the researchers (Iwai *et al*., 2019) confirmed the infection of *H. pylori* didn't affect the levels of Hb during the study on the population of Japan, which included 163 infected participants with *H. pylori*, when they conducted tests before and after treatment and eradication *H. pylori*, the level of Hb didn't change.

Table 9: The relationship between *H. pylori* and Blood platelets counts.

Gender	Patients			Control		
	PLT130-400*10^9/L	PLT<130*10^9/L	PLT130-400*10^9/L	PLT >400*10^9/L	PLT<130*10^9/L	PLT130-400*10^9/L
Male	0	6(4%)	42(28%)	0	0	55(31.43%)
Female	18(12%)	0	84(56%)	0	5(2.86%)	115(65.71%)
Total	18(12%)	6(4%)	126(84%)	0	5(2.86%)	170(97.14%)
P-value	0.004*			0.125		

* Indicates that there are significant differences using the chi-square at P ≤ 0.05.

Platelets considered as one of the components of the blood, also participate in the formation of the immune system and thrombus formation (Iba & Levy,2018).

In the present study, the ratio of thrombocytopenia was 4%, and the ratio of an increased platelet count was 12% among 150 infected with *H. pylori*. There is no significant differences between blood platelets and *H. pylori* at P ≤ 0.05, while the ratio of thrombocytopenia was 2.86%, and the ratio of an increased platelet count 97.14% among 175 non-infected with *H. pylori*, and there is no significant differences between blood platelets and *H. pylori* at P ≤ 0.05, as shown in table 9.

As well as the recent studies have shown that *H. pylori* play a role in idiopathic thrombocytopenic purpura (ITP), So the researchers (Aljarad *et al*., 2018) at Damascus

University studied the relationship of *H. pylori* with ITP, which study included 50 participants (29 males,21 females) were infected with ITP, aged between18-51 years and the percentage of infected with *H. pylori* was 72% among 50 infected with ITP, In other words, there is a relationship between *H. Pylori* and a decrease of platelet counts, this result was confirmed by the study carried out by (Lee *et al*., 2020), which included 26 patients with *H. pylori*, and after treatment and eradication of bacteria, the researchers noted an increase of platelet counts.

Another experiment was conducted on 9 mice type BALB, and after two months of infection of *H. pylori*, a decrease of platelet counts because of the interaction of the anti-*H. pylori* with the antigens which on the surface of the platelets(Fukuda *et al*., 2018).

Conclusion

In summary, during present s research steps and going through the literature review, it has been concluded that *H. pylori* infection is widely spread in the population around the world, especially among females, this type of bacteria is linked to many serious diseases such as stomach ulcers, stomach cancer, anemia, mineral and vitamins deficiency and other common diseases, therefore the author suggest to give great deal of attention to this type of bacteria, since the symptoms are not noticeable at the early stage of the infection, more attention to be given in terms of spread aware nesses and education among citizens, spread culture of preventions of occurring the disease also to encourage people to follow ways of preventions of this type of infection before it's too late, including wide screening and eradication of *H. pylori*, maintaining a safe environment for everyone by reducing the risk of the potential spread of this disease, practice good, hygiene, hand washing, food preparation and focus on those patients with chronic gastrointestinal symptoms that may be associated with *H. pylor*.

This study concluded that *H. pylori* infection has an effect on some of the blood components, whether by increasing or decreasing the number of components.

Author's recommendations that there is vital need to carry out further investigations by covering larger range of samples including: geographically wider regions in Iraq and Middle East in order to be more representative and the outcome can be analysed to see if there are any influential parameters affecting the disease, such as urban and civil areas.

The author also suggests that more research needed to include conducting blood component counts during treatment and after treatment of *H. pylori* in order to investigate the relationship between the infection with *H. pylori* and blood component counts. Many diseases related to *H. pylori* have been treated and patients have been fully recovered when treated infection of *H. pylori* such as acne rosaceam.

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