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The incidence of Helicobacter pylori infection and its impacts in diabetic patients

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ABSTRACT

Diabetes is a long-term metabolic disease marked by elevated blood sugar levels. Research indicates that compared to persons without diabetes, patients with diabetes may be more susceptible to the Helicobacter pylori outbreak. Unfortunately, not enough is known about how common Helicobacter pylori infection is in diabetics, particularly in southern Libya. Thus, the goal of our research is to determine how frequently diabetic individuals in various parts of Ubari are infected with these germs. One hundred fifty female and male diabetic patients who visited medical clinics in various Ubari places participated in this study. H. pylori IgG antibodies were measured in blood serum samples using the rapid test and enzymatic immunoassay. The level of fasting blood sugar, the human body mass index, the HbA1c, and blood group types were gathered. A questionnaire was utilized to gather information about a few habits. The individual's data was examined statistically. The results of P< 0.05 were deemed significantly different. Immunological tests revealed that the H. pylori bacteria injured 45.33% of both sexes. When it came to eating habits, the frequency of eating spicy food and smoking were not statistically different between the H. pylori-infected diabetic participants and the non-infected ones with varying values for BMI, HbA1c, and FBS. The research indicated that there was actually a variance in FBS level across HP-infected and non-HP-infected diabetic patients, slightly different among BMI, but there was no impact of the other factors.

مدى عدوى بكتيريا الهيليكوباكتر بلورى وتاثيرها على مرضى السكرى

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الكلمات المفتاحية:
عدوى بكتيريا الهيليكوباكتر بلورى
مرضى السكرى
اوبارى

الملخص

مرض السكري هو مرض استقلابي طويل الأجل يتسم بارتفاع مستويات السكر في الدم. وتشير البحوث إلى أن المرضى المصابين بمرض السكري قد يكونون أكثر عرضة لتفشي مرض الهيلوكوباكتر بيلوري، مقارنة بالأشخاص الذين ليس لديهم مرض السكري. ومما يؤسف له أنه لا يوجد ما يكفي من المعلومات عن مدى انتشار الإصابة بالعدوى بهذه البكتيريا في مرضى السكر، ولا سيما في جنوب ليبيا. والهدف من بحثنا هو تحديد عدد الأشخاص المصابين بمرض السكري في مختلف أنحاء أوباري الذين يصابون بهذه الجرثومة.

وشارك في هذه الدراسة مائة وخمسون من مرضى السكري من الإناث والذكور الذين زاروا العيادات الطبية في مختلف أماكن أوباري. وقد قيست الأجسام المضادة في عينات مصل الدم باستخدام الاختبار السريع والاليزا

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,مستوى السكر الصيامى والسكر التراكمى الدموي ، ومؤشر كتلة الجسم البشري بالإضافة الى فصائل الدم، استبيان لجمع معلومات عن عدد قليل من العادات. وقد تم فحص بيانات الفرد إحصائياً .

بينت النتائج ان 45.33 في المائة من كلا الجنسين مصابين. وعندما يتعلق الأمر بالعادات الغذائية، لم يكن تواتر تناول الطعام الحار والتدخين يختلف إحصائياً بين المشاركين في مرض السكري المصابين بالبكتيريا وغير المصابين بقيم متفاوتة بالنسبة أيضا للاختبارات المستهدفة.

وأشار البحث إلى أن هناك في الواقع فرقاً في مستوى السكر الصيامى بين المرضى المصابين بالبكتيريا المستهدفة والمرضى غير المصابين بها، واختلاف طفيف بين مؤشر كتلة الجسم، ولكن لم يكن هناك تأثير للعوامل الأخرى .

1. Introduction

Helicobacter pylori is a type of gram-negative pathogen that invades the human digestive tract. It is considered one of the least frequent bacterial outbreaks worldwide, affecting approximately fifty percent of the global human population. *H. pylori* is mainly spread oral or oral-feces ways, and it is usually acquired during childhood. [1] This bacterium is unique in its ability to survive in the extremely acidic condition of the stomach. It produces unease, an enzyme that converts urea into ammonia, which helps neutralize the surrounding acidity and creates a more favourable environment for its survival. *H. pylori* has a spiral shape and possesses multiple flagella, which enable it to move through the mucus layer and attach to the surface cells of the gastric lining [1, 2]

According to the investigations done in the towns of Misrata, Libya [3], Karachi, Basra, Iraq [4], Pakistan [5], Iran [6], and Turkey [7], a substantial difference was identified between diabetic patients and healthy people. All five researches revealed that diabetes persons are more likely to contract *H. pylori*.

Numerous research experiments have looked into the potential link between *H. pylori* infection and metabolic problems such as blood sugar resistance, diabetes mellitus, and metabolic disease [8].

H. pylori is a pathogenic germ that was first discovered inside the stomach in 1983 [2]. Since then, numerous studies have focused on understanding its role in gastrointestinal disorders. Further studies have revealed that *H. pylori* illness is not mainly involved in the relapse leading to peptic ulcers but may also have implications for digestive problems, as mentioned above [8] Insulin resistance is a circumstance in which the body's cells become less responsive to the impacts of insulin, which leads to impaired glucose metabolism [2, 8] Evidence suggests that *H. pylori* illness may lead to insulin resistance through various mechanisms [7]. Additionally, *H. pylori* illness can promote persistent gastric irritation and digestive atrophy, which may lead to impaired nutrient absorption and subsequent metabolic dysfunction [9].

Furthermore, studies have found that *H. pylori* infection can lead to dyslipidemia, a condition characterized by abnormal levels of lipids in the blood, including elevated levels of cholesterol and triglycerides [8,9, 10]. One study investigated the connection between *H. pylori* infection and metabolic problems in a large proportion [10]. The results of these studies showed a substantial and independent connection between *H. pylori* infection and metabolic illnesses. [8,9,10]. Additionally, a number of metabolic markers were discovered to be substantially correlated with *H. pylori*, including arterial blood pressure, cholesterol, and the levels of low- and elevated-density lipoprotein [7,11]

However, the findings regarding the correlation between *H. pylori* illness and metabolic disorders have not been consistent across all studies.[7,8,9,10,11] The responsibilities of *H. pylori* infection in the development and progression of metabolic problem, such as insulin resistance, diabetes mellitus, and metabolic illness , is still a topic of ongoing research and debate [12]. Furthermore, *H. pylori* infection has been identified as a potential factor for metabolic syndrome, a series of conditions that elevate the risk of cardiovascular illnesses and other health complications [13]. The correlation between *H. pylori* illness, its prevalence, and the development of diabetes and stomach disorders has garnered significant attention in recent years [10, 12 .15, 16].

In addition, infection with *H. pylori* has been identified as a community health issue impacting over half of the global population. It is considerably more common in underdeveloped parts of the world than in industrialized nations, though incidence varies according to geographic region, stage of life, and social and economic position. It is a frequent illness in people suffering from increased blood sugar [5]. Therefore, several diagnostic methods are available to detect *H. pylori* infection, including serological examinations, urea respiration tests, feces antigen tests, and en endoscopic biopsies for histological examination [1, 17] Treatment of *H. pylori* infection typically involves a mixture of antibiotics, such as clarithromycin, amoxicillin, and metronidazole, along with proton pump inhibitors to minimize gastric acid secretion [1, 17]. Furthermore, certain diabetes medications, including repaglinide, may interact with some common antibiotics used to treat *H. pylori* infection, like clarithromycin, necessitating dosage adjustments [17].

The purpose of this research is to investigate the occurrence of *H. pylori* pathogenic bacteria in diabetes patients' serum in various parts of Ubari. Furthermore, examining the association between infection and HbA1c and blood glucose level markers. In addition to determining the risk of infection based on diabetes duration, type of blood group (ABO), BMI, and other factors

Methodology

The participants in this study were all diabetics. Their ages vary from 20 to 80 years elderly. The male and female counts were 95 and 55, respectively. The participants were tested in a variety of Ubari regions' medical clinics, and specimens were taken in the first two months of 2020. The research ethics committees of Sahba University gave their permission for the study to be conducted. Fasting blood sugar (FBS) and hemoglobin A1c levels were measured, as well as a test for the non-quantitative identification of antimicrobial immunoglobulin utilizing the *H. pylori* antibody, the quick test (Right Sign, China), and an enzyme-linked immunosorbent assay (ELISA) (Diagnostic Automation, Inc.). When the concentration of the antibodies reaches a value higher than 1.10, the antibody test is positive. ABO blood group determination was also performed. A questionnaire was used to collect information such as age, gender, diabetes duration, smoking history, spicy food intake history. BMI was computed, with < 18.5 deemed underweight, 18.5-25 regarded as a typical weight, >25-30 considered overweight, and >30

considered obese [18]. The Chi-square test, the 2-sample t-test, correlation and the Anova two-way were used to examine the study's results statistically and logically. Using the Minitab 16.1 application, the value ($P < 0.05$) was declared substantial, and the graphic results were provided.

Results

Positive of *H.pylori* infection and IgG titer-:

In this research, a total of 150 diabetics patients with an average age of **143.08** ± **3.04** were enrolled, involving 95 (63.3%) males57.61±1.30 and 55 (36.7%) females **85.47** ± **.174**

In the diabetic groups, the incidence of *H. pylori* infection was 67 (44.67%) and 68 (45.33%) by rapid test and ELISA, respectively; this difference was not significant, as shown in Table 1. We concentrated on the ELISA test findings, which revealed the number of positive results (*H. pylori* +) among males 43 (63.2%) and females 25 (36.8%) (*P > 0.05).* [Table 2]. On the other hand, the number of positive individuals based on IgG titer varied by diabetic group, figure (1) shows that the greatest numbers were 17 and 12 for IgG titer ranges of 3-2.01 and >9.01 IU respectively (*P>0.05*).

Table 1. Compare between Rapid Cassatt test and ELISA

Type of test	Infected with H. pylori No. (%)	Non-Infected with H. pylori No. (%)	Total
Rapid Test	**67 (44.67)**	**83(55.33)**	150
ELISA	**68 (45.33)**	**82 (54.67)**	150

T- Value = 0.00 P-Value = 1.000

Table2 *H. pylori* infection among diabetic patients

Gender	Diabetic HP^+ NO.%	Diabetic HP^- NO.%
Males	43 (63.2)	52 (44)
Female	25 (36.2)	30 (76.5)

T- Value = - 0.55 P-Value = 0.639

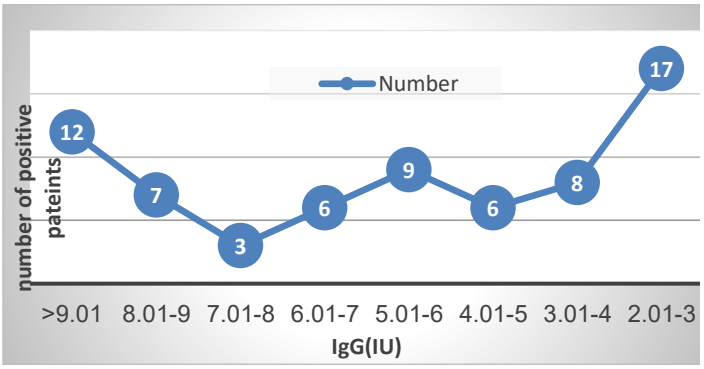

Figure 1. Number of positive patients according to IgG titer range*P≥0.05*

The length of diabetes and distribution of *H. pylori* spread across illness groups:-

Within term of duration of diabetic diseases, *H.pylori* infection was recorded at 10–14, 5–9, and 19–15 years of infection by the number of patients, with 14, 9, and 8 being the highest number, respectively. Patients at <30 and 29–25 years of infection duration were negative for the HP antibody, and the number of patients was 10, 15, respectively. No-significantly compared to the seropositive group, as shown in Figure 2 *(P > 0.05).*

On the other hand, for more than 30 years of infection, the majority of diabetic patients were sero-negative rather than positive.

In 51-60 year old men and women, the number of *H.pylori* infected patients was 17, and 13, respectively, which was not statistically significant within the same gender. In the same age group, the number of non-HP infections was 23, 9 patients, then came 61-70 and 41-50yr. old for both genders. Two patients above the age of 80 obtained sero-negative and positive results were for men. All diabetic groups that participated had a lower number of people aged 20 to 30. There was no statistically important difference between HP-positive and negative individuals [Figure 3].

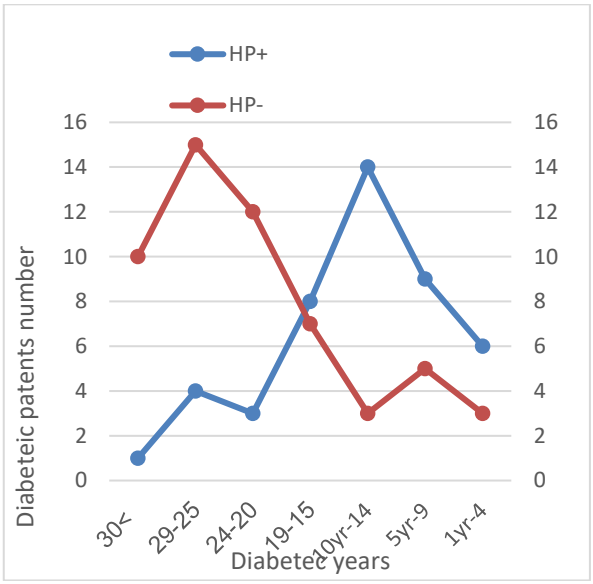

Figure 2. Diabetic duration dysfunction in patients infected with *H.pylori* positive, T- Value = - 1.64 , *P-Value* = 0.126

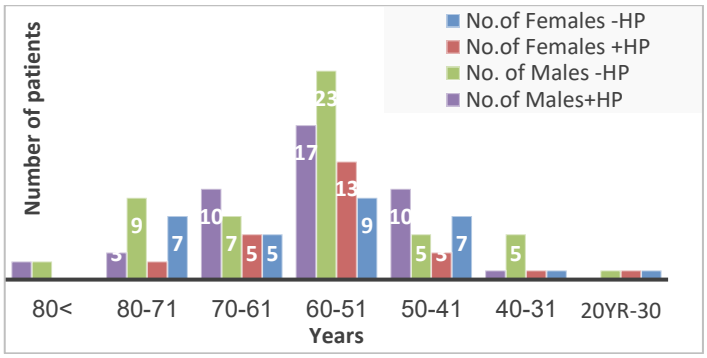

Figure 3. Number of *H.pylori* infection and age range for diabetic group *P>0.05.*

***H.pylori* infection and blood group:-**

According to figure 4, blood group O + had the highest number of sero-positive and negative responses respectively. A+ group was followed by B+, then AB+.

The lower number was at the other blood group and non-statistically significant difference between them.

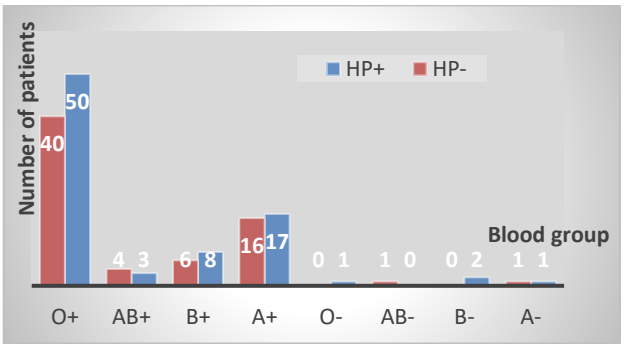

Figure 4 Number of *H.pylori* infection into diabetic groups depending on blood grouping category *P>0.05*

The lifelong behaviours of the diabetic groups-:

The result was a statistically important difference between the HP^- infection and HP^+ infection rates of 95 versus 42 individuals who had a spicy meal and 43 vs. 18 for non-spicy food. Fewer people smoke (9 vs. 5, as mentioned earlier), although this difference is not statistically significant, as illustrated in Figure 5.

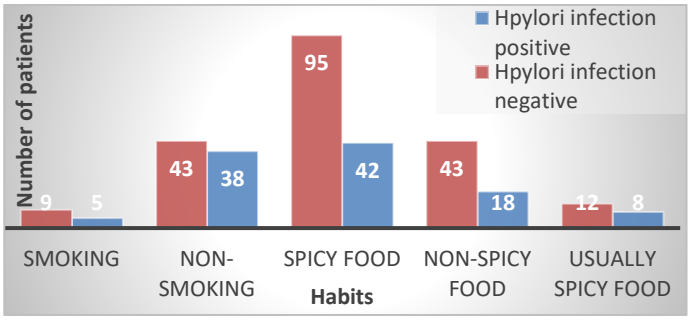

Figure 5: The quantity of enduring habits among people with diabetes *P>0.05* .

Body mass index, *H.pylori* infection, and a comparison of the tested parameter for the diabetic group:-

Table 3 shows that, with regard to BMI, 46 patients with *H.pylori* infection (95.9%) were overweight, 55 non-HP infected patients (103.9%) were overweight, and 21 (52.5%) and 24 (57.3%) were normal for both genders (*P>0.05%).* When it came to *H.pylori* infection, the FBS of the seronegative group was considerably greater in males (77 ± 199.1 vs. 12 ± 203.9) than it was in females (14 ± 8.85 vs. 17 ± 209.2) *P<0.05*. For both males and females, the average age of HP-negative participants was not substantially greater than that of the seropositive group (1.9 ± 57.8 vs. 1.7 ± 57.8) and (2.6 ± 58.9 vs. 2.2 ± 58.0) respectively. However, as Table 4 illustrates, the HbA1c of the seropositive group was not substantially greater compared that of the seronegative group in the female but equal for the male groups (0.46 ± 8.56 vs. 0.42 ± 8.85) and (0.33 ± 8.51 vs. 0.33 ± 8.57) respectively.

Table4. Comparison of the tested parameter in the group of diabetics

Gender	H.pylori infection	HbA1c (%)	FBS (mg/dl)	BMI (kg/m2)	Age (year)
			Means±SD		
Males	**Infected**	0.33±8.51	12± 203.9	0.85±26.38	1.7 ±57.8
	Non-infected	0.33 ±8.57	77 ±199.1	0.81 ±26.75	1.9 ±57.8
Females	**Infected**	0.46 ±8.56	17 ±209.2	1.1 ± 30.89	2.2± 58.0
	Non-infected	0.42 ±8.85	14 ±182.4	1.2 ± 28.07	2.6 ± 58.9
P-value		>0.05	<0.05	>0.05	>0.05

Table 3: HP infection and body mass index for the diabetes group

BMI range	HP infection	Gender		Total
		Females	Males	
Under	Non-infected	(%1.00)1	(%3.00)1	(%4.00)2
P>0.05	Infected	(%0)0	(% 6.6)2	(%6.6)2
Normal	Non-infected	(% 5.6)9	(%51.7)15	(%57.3)24
P>0.05	Infected	(%4.3)7	(%48.2)14	(%52.5)21
Over	Non-infected	(%41)16	(%62.9)39	(%103.9)55
P<0.05	Infected	(%58.9)23	(%37)23	(%95.9)46
Total	**Non**	**(%47.6)26**	**(%117.6)55**	**(%165.2)81**
P>0.05	**Infected**	**(%6.32)30**	**(%91.8)39**	**(%98.12)69**

Discussion

Based on the study's findings, a significant proportion of diabetes patients in Ubari (45.33%) had *H. pylori* infection. This percentage was greater than that of studies conducted in Nigeria that was equivalent to 18% [19] and, Saudi Arabia, which reached 26.9% [20]. Although it was less than the 50.5% found in a 2012 survey conducted in Benghazi [21].

On the other hand, Because Elisa has a lower false-positive rate than a fast test; it is thought to be more accurate in detecting the presence of antibodies in blood samples. Rapid tests, however, can yield false positive or negative findings and they are less accurate than Elisa testing [22]. Additionally, the findings of other research show that the outbreak of ***H.pylori*** infection elevate with age; however, the rate is nearly the same in both genders (male and female), [23] which is not the case in the current investigation. Furthermore, 63.2% of the men and 36.8% of the women in the entire group tested positive for ***H.pylori*** in diabetes. Although 44% of men and 76.5% of women with diabetes had ***H.pylori*** negative infections, this difference was not substantially significant. This is in parallel with the study done by Wu et al. [24] which found that more males than women examined positive for *H. pylori* illness. Moreover, a Taiwanese study that looked at the prevalence of *H. pylori* infections in both men and women revealed a similar pattern to our own study [25].

Akeel et al. [26] reported that a non-comparable study conducted in Saudi Arabia revealed the outbreak in men (48%) and women (51.2%), while Oluyemi et al. [19] reported a research conducted in Nigerian city (15.6% vs. 10.9%). On the other hand, some research revealed that there is no appreciable variation in the outbreak of *H. pylori* infection between genders. As to Aguilar-Garcia et al. [27], a study conducted in Spain revealed a difference of 39.2% compared to 38.5%. According to epidemiologic research, the frequency of *H. pylori* illness varies significantly with years of age [25]. A cross-sectional investigate carried out in a university clinic in mainland China revealed that, for people under 36, the value of *H. pylori* infection elevates with age; however, for people over 36, there was no discernible relationship between age and prevalence [28]. Other finding of this study is that, in men, the correlation between age and *H. pylori* infection is inverse (r= -0.07, *P>0.05*) and has a non-statistically important weak correlation within women's (r= 0.08, *P>0.05*). According to our research, the majority of patients, regardless of gender, were between the ages of 51 and 60 yr. old. We think this is because of the Libyan people's traditional lifestyle and their frequent participation in social events in the southern region at this age.

Research indicates that the frequency of *H. pylori* illness rises with years of aging, with older adults having greater rates than younger adults. For instance, a Japanese study discovered that the incidence of *H. pylori* infection averages from 34.4% in people aged 20 to 29 to 66.2% in people aged 70 to 79 [29]. Comparably, a Korean study found that the occurrence of *H. pylori* infection ranged from 40.6% in people aged 20 to 29 to 72.9% in people aged 60 to 69 [30] .Age and gender differences exist in the outbreak and clinical symptoms of *H. pylori* illness, despite the fact that it can affect individuals of any age or gender. Research indicates that there may be differences in the prevalence of *H. pylori* infection between males and females. In certain groups of people, the outbreak of *H. pylori* illness is slightly greater in men than in women. The precise causes of this disparity, which could be influenced by a number of variables including location, socioeconomic level, and way of life, are not entirely known.

Compared to diabetes without *H. pylori* infection (54.6%), the occurrence of HP illness in diabetes was not grater (45.3%).Diabetes, therefore, does not increase the risk of *H. pylori* infection. The results of additional investigations supported these conclusions, indicating that there is no connection between diabetes and *H. pylori* infection [19 , 31 , 32 , 33 , 43]. The prevalence of *H. pylori* infection in diabetics has been reported to be lower than in normal people, even in a research by Zelenková et al. [35]. According to our data, there are more patients with high and low range titers than those with fluctuating IgG titers. Patients who have an active *H. pylori* infection usually have greater IgG titers than individuals who have either never been infected or effectively treated for the infection [36]. It is crucial to remember that IgG titers might be high for a while after a successful course of treatment since the antibodies can linger in the blood for a while. [35]. The recent finding also showed that the value of *H. pylori*-eradicated participants had a bigger decline in those with a longer period following elimination. Previous studies have reported that the anti-HP IgG titer in the blood was lowered after successful

treatment [37]. When evaluating the efficacy of a treatment or if the infection has been completely eradicated, tracking IgG titers over time can be helpful. A noteworthy reduction in IgG titers signifies an efficacious response to therapy, whereas consistently elevated titers could signify a continued infection or reinfection [37].

The length of the *H. pylori* illness with diabetes. The length of diabetes did not differ statistically significant between the HP^+ and HP^-infected groups in our study; nevertheless, there was a strong inverse correlation between the number of HP^+ infected patients and the duration of diabetes (r= -0.63, P>0.05). We observed a decrease in patients during a period of more than 30 years, while the number of diabetic non-infected *H. pylori* patients increased during the same period (1 versus 10). We did not find our concept to compare the length of diabetes and the acquisition of *H. pylori* infection since other research concentrated on the length of diabetes and its impact on glucose levels in patients with *H. pylori* infection. When we look at our diagram, note the unique line drawn to our cohort (HP^+ and HP^-diabetic patients).

In the our research, we found an relation between *H. pylori* illness and elevated body mass index (overweight) in women with statistical significance but not in men. However, a positive relationship was observed between *H. pylori* infection and BMI in women. These results indicate the hypothesis that sex-specific metabolic factors are correlated with *H. pylori* infections. Bigger sample sizes and deeper studies are needed to further identify sex-specific risk factors for *H. pylori* infection Our results were in parallel with those of Wu et al., [24] who found that whereas men showed the reverse impact, overweight women were more likely than non-infected women to be *H. pylori* -positive(P<0.05%). Additionally, this findings showed that women with *H. pylori* nfection had greater BMI than non-HP infection (23.02±3.34 vs. 22.31±3.27, P<0.05%), whereas men did not (24.93±3.54 vs. 24.95±3.50, P>0.05%).

Our current study found an important connection between the ABO blood group and *H. pylori* infection, with patients with blood group O being more susceptible to the illness than those with A^+, B^+, AB^+, and other blood group types. O blood type may be connected with an elevated risk of *H. pylori* infection, according to a meta-analysis research [38]. Furthermore, research indicates that blood types O and A/AB are linked to higher risks of *H. pylori* infection and stomach cancer, respectively [39]. So, most blood groups in the southern region of Libya are O-positive [40].

The study revealed that the non-smoking and non-eating habit (spicy food) groups had a higher overall outbreak of *H. pylori* illness than the smoking and spicy food groups within the diabetes group. This is the same as the results described by Habbash, F. et al. [41].

Regardling the impact of *H. pylori* infection on FBS levels, based on the gender in men, serum FBS values were greater in those with non-*H. pylori* infections than in those with HP^+ infections; while in women, the effect was inverse (77±199.1 vs. 12 ±203.9, and 14 ± 182.4 vs. 17 ± 209.2, P<0.05, respectively). Wu et al. [24] reported higher FBG levels in *H. pylori* -infected women compared to non-infected women. However, our results did not coincide with the men's results (5.21±1.06 vs. 5.12±0.98, and 5.61± 2.04 vs. 5.38± 1.41, P<0.05, respectively). Diabetes, then, does not increase the risk of contracting *H. pylori* nfection.

Our results are in contrast to those of Hsieh, M. C. et al. [42], who found that long-term *H. pylori* infection is substantially connected with high rates of HbA1c and decreased insulin secretion in this Chinese population. Our findings indicate that there is no real difference between *H. pylori* -infected and non-infected HbA1c levels for both men and women.

For the research of HbA1c cases, a large sample size and a specific degree of confidence are ideal [43]. Our findings could be explained by the correlation between higher glycosylated hemoglobin **A** and *Helicobacter pylori* infection, as a result, the sample size is small for our study.

Conclusion

The correlation between serum glucose levels and *Helicobacter pylori* (HP), one of the major public illnesses, was not in line with other research. Furthermore, there is conflicting data on the connection between diabetes and *H. pylori* infection. The goal of this research was to investigate the association between glycemic *H. pylori* infection and potential factors that could influence the difference between diabetic patients with *H. pylori* infection and those who do not have *H. pylori* infection.

This study found that among a portion of a population from southern Libya, there are changes in the way that certain characteristics are connected with *H. pylori* illness that are specific to diabetes. Nonetheless, there was no discernible difference in the overall outbreak of *H. pylori* illness across the sexes, with a higher incidence in men, elevated FBG and MBI (overweigh) in women compared to men. A certain age was linked to *H. pylori* infection, and there was a special relationship between the number of *H. pylori* infection patients and the duration of diabetes. When compared to patients in the non-HP infected diabetic group who have shown actual effects, there is no impact in the daily habits (food and smoking), blood group type, or HbA1c level amongst *H. pylori* infected diabetic patients. These results underline how crucial it is to determine sex-specific metabolic variables connected with *H. pylori* infections at an early stage, keeping an eye on these metabolic variables and taking the proper diagnosis.

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