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Prevalence and Hematological Effects of Helicobacter pylori Infection in Tobruk, Libya: A Cross-Sectional Study

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انتشار عدوي Helicobacter pylori وتأثيرها علي المؤشرات الدموية للأفراد في مدينة طبرق. ليبيا

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الملخص:

هدفت هذه الدراسة إلى تحديد معدل انتشار بكتيريا **Helicobacter pylori (H. pylori)** بين سكان مدينة طبرق خلال شهر أكتوبر **2023.** تم جمع العينات من مختبر ابن رشد، حيث تم تحليل **362** حالة إحصائيًا للكشف عن العدوى البكتيرية . أظهرت النتائج أن **174** حالة من أصل **362 (48.06%)** كانت إيجابية لـ**H. pylori** ، بينما كانت **178** حالة **(49.17%)** سلبية، و **10**حالات **(2.76%)** على الحد الفاصل. علاوة على ذلك، بحثت الدراسة تأثير الإصابة بـ **H. pylori** على المعايير الدموية باستخدام **50** عينة **(30** أنثى و **20** ذكراً) .كشفت النتائج أن الذكور أظهروا انخفاضًا في متوسط تركيز الهيموغلوبين **(MCH)**بنسبة **(45%)** ، ومستوى الهيموغلوبين **(HGB)** بنسبة **(55%)** ، ونسبة الصفائح الدموية **(PCT)** بنسبة **(40%)**، مع زيادة في متوسط حجم الصفائح الدموية **(MPV)** بنسبة **(45%)** و **PCT** بنسبة **(50%)** أما في الإناث، فقد أظهرت **MPV** و **PCT** زيادة متوسطة بنسبة **(83.3%)**، بينما بقيت القيم الدموية الأخرى ضمن المعدل الطبيعي. لخصت هذه الدراسة إلى أن سكان منطقة طبرق لديهم معدل مرتفع نسبيًا للإصابة بـ **H. pylori** ، مع تأثيرات ملحوظة على المعايير الدموية.

الكلمات الدالة: فقر الدم، جرثومة الملوية البوابية، التأثيرات الدموية، الانتشار، ليبيا، طبرق

Abstract:

This study aimed to determine the prevalence of Helicobacter pylori (H. pylori) among the residents of Tobruk in October 2023. Samples were collected from the Ibn-Rushed Laboratory, and 362 cases were statistically analyzed for bacterial infection. The results showed that 174 out of 362 cases (48.06%) were positive for H. pylori, 178 cases (49.17%) were negative, and 10 cases (2.76%) were borderline. Furthermore, the study investigated the effect of H. pylori infection on hematological parameters using 50 samples (30 females and 20 males). The results revealed that males showed a decrease in mean corpuscular hemoglobin (MCH) (45%), hemoglobin (HGB) (55%), and plateletcrit (PCT) (40%), along with an increase in mean platelet volume (MPV) (45%) and PCT (50%). In females, MPV and PCT showed a mean increase of 83.3%, with other blood values remaining within the normal range. This study concluded that the

population in the Tobruk region has a considerably high frequency of H. pylori infection, with significant effects on hematological parameters.
Keywords: Anemia, helicobacter pylori, hematological effects, prevalence, Libya, Tobruk**.**

1. Introduction:

Helicobacter pylori is a Gram-negative, spiral-shaped bacterium that primarily resides in the acidic environment of the human stomach. It has been identified as a major cause of various gastrointestinal diseases, such as peptic ulcers, chronic gastritis, and gastric cancer (Lee et al., 2021). This bacterium is capable of surviving in the harsh acidic environment due to its unique adaptation mechanisms, including the production of urease, which neutralizes stomach acid (Kim et al., 2022).Recent studies suggest that H. pylori is not only responsible for local gastric disorders but also plays a role in systemic conditions, including iron deficiency anemia. This is thought to occur due to the bacterium's influence on gastric mucosa integrity and impaired iron absorption (Johnson et al., 2023). In fact, the systemic effects of H. pylori are a growing area of research, highlighting its far-reaching impact beyond the stomach (Wang et al., 2020).Diagnosis of H. pylori infection typically involves both invasive and non-invasive methods. Invasive methods include endoscopy with biopsy, histological examination, culture, and rapid urease testing. Non-invasive tests include the urea breath test, stool antigen tests, and serological assays (Choi et al., 2024). These diagnostic tools have evolved to improve sensitivity and specificity, enabling more accurate and accessible detection of infections (Park et al., 2021).Given the global prevalence of H. pylori and its potential systemic effects, this study aims to explore the hematological impact of this bacterium in the region of Tobruk, with an emphasis on its role in conditions such as anemia (Al-Rashed, 2022.(

.2Materials and Methods:

2.1Study Area and Population:

This study was conducted in Tobruk, Libya, during October 2023. A total of 362 samples were collected from the Ibn-Rushed Laboratory to analyze bacterial infection, while hematological parameters were assessed in 50 cases (30 females and 20 males.(

2.2Analysis Methods and Reagents:

The H. pylori IgG antibody test was used to detect bacterial infection in stool samples, while the IgM test and complete blood count (CBC) analysis were performed to assess hematological parameters. Statistical calculations included percentages and T-tests to analyze gender-based differences.

2.3Data Analysis

Data were presented in tables and figures, with results expressed as percentages and numerical values. Differences between males and females were statistically analyzed.

.3Results:

The results of this study showed that 174 of 362 cases (48.06%) were positive for Helicobacter pylori , and 178 cases (49.17%) were negative. It was also found that 10 of 362 cases (2.76%) were borderline cases,. As shown in Table 1 and Figure 1

Table 1: Shows the positive and negative results for H. pylori in study sample

Results	Freguency	Percent
Negative	178	49.17 %
Positive	174	48.066 %
Borderline	10	2.76 %
Total	362	

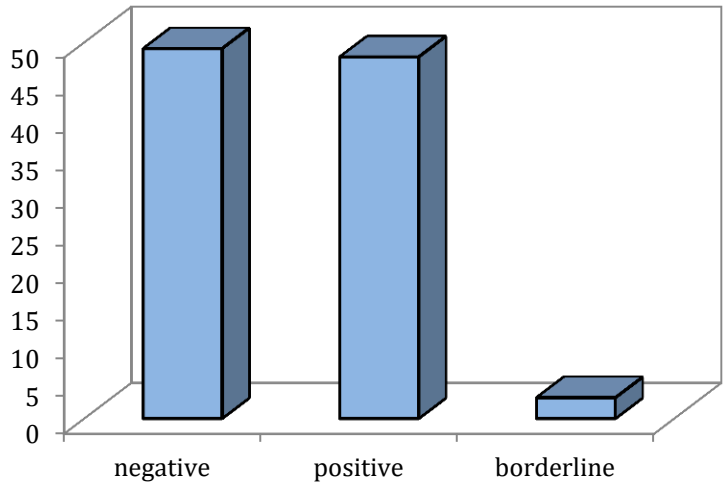

Figure5: The distribution of cases of H. pylori according to IgG

One of the tests that , the study samples the complete blood count (CBC) . this test was conducted on 50 infected cases , including 30 females and 20 males . the CBC was calculated for males as shown in table 2. The results showed that , there were rates of increase in (MPV) by 45% and (PCT) by 50% and a decrease in hemoglobin (HGB) levels of 55% and in (MCH) by 45 %.

Table2: Shows complete blood count rates in males infected with H. pylori

Test parameter	Normal	Increase	Decrease
WBC	80 %	20 %	0 %
LYM	95 %	5 %	0 %
MXD	61 %	22.2 %	16.6%
NEUT	70 %	0%	30%
RBC	80%	20%	0%
HGB	45%	0%	55%

HCT	95%	0%	5%
MCV	95%	0%	5%
MCH	55 %	0 %	45%
MCHC	75%	0%	25%
RDW	70%	0%	30%
RDW-CV	100%	0%	0%
PLATELATE	85%	15%	0%
MPV	55%	45%	05
PCT	10 %	50%	40%

While in females, (CBC) results showed that , there were rates of increase in (MPV) by 83.3% and also in (PCT) by 83.3%. as shown in the table 3.while other rate were normal.

Table 3: shows complete blood count rates in females infected with H. pylori

Test parameter	Normal	Increase	Decrease
WBC	86.66%	10 %	3.33%
LYM	96.6%	3.33%	0%
MXD	56.6%	16.6%	26.6%
NEUT	80%	05	20%
RBC	93.3%	6.6%	0%
HGB	66.6%	0%	33.3%
HCT	80%	6.6%	13.3%
MCV	80%	0%	20%
MCH	66.6%	0%	33.3%
MCHC	70%	0%	30%
RDW	83.3%	0%	16.6%
RDW-CV	100%	0%	0%
PLATELATE	93.3%	6.66%	0%
MPV	16.6%	83.3%	0%
PCT	3.33%	83.3%	13.3%

Table 4: shows the rates of change for both males and females in (HGB-MCH-MPV-PCT)

Test parameter	Normal		Increase		Decrease	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
HGB	45 %	66.6%	0%	0%	55%	33.3%
MCH	55%	66.6%	0%	0%	45%	33.3%
MPV	55%	16.6%	45%	83.3%	0%	0%
PCT	10%	3.33%	50%	83.3%	40%	13.3%

In addition, when performing a statistical analysis of T.Test for sample of patients of both sexes and comparing the blood value for (HGB-MCH-MPV) the results showed that, there were significant differences in the normal levels of haemoglobin, where males were more affected than females, with an average of (14.30) while females average (12.29). likewise, in rates of decline males were more affected than females, with an average (11.5). as for the blood values, there are no significant different between the rates of blood values between males and females .as shown in the tables (5-6-7)

Table 5: shows the mean and P-value between males and females for normal rate for (HGB-MCH)

Test parameter	gender	Mean	p-value
HGB	Male	14.30	0.000
	female	12.29	
MCH	Male	28.74	0.079
	female	28.55	

Table 6 : shows the mean and P-value between males and females for decrease rates for (HGB-MCH-PCT)

Test parameter	gender	Mean	p-value
HGB	Male	11.51	0.003
	female	9.93	
MCH	Male	24.97	0.079
	female	22.70	
PCT	Male	0.198	0.479
	Female	0.192	

Table 7: shows the mean and P-value between males and females for Increase rates for (MPV- PCT)

Test parameter	Gender	Mean	p-value
MPV	Male	9.933	0.927
	Female	9.957	
PCT	Male	0.320	0.428
	Female	0.298	

4. The discussion

The prevalence rate of Helicobacter pylori infection in Tobruk city, as indicated by the current study, aligns with the high infection rates reported in numerous global studies. In the Tarhuna region, for instance, a study by Mezmale et al. (2020) reported that 64.60% of participants were infected with H. pylori, with 29 cases showing positive results for both IgG and IgM, 19 for IgM only, and 25 for IgG only. This is in line with several studies highlighting high infection rates in various countries such as Russia, Jordan, Iran, Canada's Arctic populations, China, and Latin American nations. Similarly, a study in Saudi Arabia found that 55.00% of university students had positive IgG antibodies against H. pylori (Mahrazi et al., 2020), and in Iraq, a study by Hussen et al. (2023) found that 55.80% of 173 students tested positive for the infection (Okoroiwu et al., 2022). [Mezmale et al., 2020]

Furthermore, studies conducted within Libya itself corroborate these findings. For instance, a study in the Kasr Khiar region by Nami et al. (2020) revealed that 85% of 125 asymptomatic university students were positive for H. pylori. Similarly, research conducted in Sirte showed a positive antibody rate of 83% in 60 participants (Abdallah et al., 2021). At Benghazi Teaching Hospital, Mohammad et al. (2020) observed a seropositivity rate of 71.4% among 662 participants. In a more recent study in Tarhuna, a 2021 graduate research project found that 47.3% of 815 cases from medical laboratory records were positive for H. pylori (Keramati, 2020). [Nami et al., 2020; Abdallah et al., 2021; Mohammad et al., 2020]

The high infection rates in the Tobruk University sample may be attributed to factors such as educational level, socioeconomic status, living conditions, poor eating habits, and consumption of untreated well water. These factors are consistent with findings from various studies indicating that H. pylori transmission is influenced by sanitation, dietary habits, and access to clean water (Keramati, 2020). [Keramati, 2020]

Helicobacter pylori bacteria reside in the stomach and duodenum without causing symptoms initially, but over time, they can lead to conditions like ulcers or even gastric cancer due to damage to the stomach lining. There is increasing interest in the role of H. pylori in diseases outside the digestive system, especially in relation to anemia. In this study, antibodies to H. pylori were detected in both stool and blood samples. The results indicated a significant number of infections within just one month. Furthermore, blood tests showed that while most blood values remained within the normal range, hemoglobin (HGB) levels were notably lower, particularly among males, where 55% showed reduced HGB levels compared to 45% of those with normal levels. In females, 3.33% had decreased HGB levels (Keramati, 2020). [Keramati, 2020]

Several studies have linked H. pylori infection to anemia through various mechanisms. H. pylori colonization impairs iron absorption due to decreased stomach acid levels, affecting iron transport and leading to blood loss from conditions like gastritis and duodenitis. Additionally, H. pylori infection is associated with increased production of hepcidin, a protein that regulates iron metabolism and prevents iron release from intestinal stores (Shaldoum, 2021). [Shaldoum, 2021]

In terms of hematological values, this study's findings align with those of Kibru (2020), who reported similar changes in hemoglobin (HGB), mean corpuscular hemoglobin (MCH), and red blood cell (RBC) counts in H. pylori-infected individuals. However, other hematological values such as hematocrit (HCT) and mean corpuscular volume (MCV) showed inconsistent results. In contrast, studies in Nigeria have reported higher white blood cell (WBC) counts in patients, which may reflect an immune response to active H. pylori infection, particularly the elevated levels of neutrophils during inflammation (Allagoa, 2020). [Kibru, 2020; Allagoa, 2020]
The findings of this study are also in line with the research conducted in Palestine, which found no significant changes in platelet levels but identified notable differences in HGB levels, which varied from the study's findings in RBC, WBC, HCT, and MCHC levels (Mwafy, 2020). [Mwafy, 2020]

5-Conclusions:

1 Through the reults of this study, which was conducted to determine the effect of infection with H.Pylori bacteria on blood values, the results obtained for the study samples showed ,that males had an mean decrease in both MCH (45 %) , HGB (55%) and PCT (40 %).and increase in MPV (45%) and PCT (50%). While in female mean increase in MPV and PCT (83.3%) . And other blood values within the normal range

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