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Seroprevalence of H. pylori Infection Among Anemic Patients in Tarhuna City

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معدل الانتشار المصلي للإصابة بجرثومة المعدة لدى مرضى فقر الدم في مدينة ترهونة

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Abstract

Background: Anemia, particularly iron deficiency anemia, is a significant global health problem. While various factors contribute to its etiology, recent evidence suggests a strong association with *Helicobacter pylori* infection [1-3]. This study aimed to determine the seroprevalence of *H. pylori* in a population and to assess the association between *H. pylori* infection and anemia.

Methods: A total of 100 participants were enrolled in a cross-sectional study. The population was divided into two groups: an anemic group (n=21) and a non-anemic group (n=79). The presence of H. pylori infection was determined by detecting *H. pylori* IgG antibodies in serum [12,13]. A Chi-square test was performed to evaluate the statistical significance of the association between H. pylori seropositivity and anemia status, with a significance level set at $p<0.05$ [7,8].

Results: The overall seroprevalence of *H. pylori* was 55% (n=55). A significantly higher seroprevalence was found in the anemic group (85.7%, n=18) compared to the non-anemic group (46.8%, n=37) [7]. The association between **H. pylori**seropositivity and anemia was found to be statistically significant ($\chi^2(1) = 11.83$, $p<0.001$) [7,8].

Conclusion: This study demonstrates a strong and highly significant association between H. pylori infection and anemia [6,7,8].

The findings suggest that H. pylori is a major risk factor for anemia.

Keywords: H. pylori, Anemia, IgG, CBC, Seroprevalence.

الملخص

الخلفية :يُعد فقر الدم، لا سيما فقر الدم الناجم عن نقص الحديد، مشكلة صحية عالمية كبرى. وبينما تساهم عوامل متنوعة في مسبباته، تشير الأدلة الحديثة إلى وجود ارتباط قوي بينه وبين عدوى الملوية البوابية [1-*Helicobacter pylori*). هدفت هذه الدراسة إلى تحديد معدل الانتشار المصلي لبكتيريا الملوية البوابية بين السكان، وتقييم العلاقة الارتباطية بين العدوى بها والإصابة بفقر الدم.

طرق العمل :شملت هذه الدراسة المقطعية إجمالي 100 مشارك، جرى تقسيمهم إلى مجموعتين: مجموعة المصابين بفقر الدم (العدد = 21) ومجموعة غير المصابين بفقر الدم (العدد = 79). وتُحُدِّد وجود عدوى الملوية البوابية عن طريق الكشف عن الأجسام المضادة من النوع (IgG) الخاصة بها في مصل الدم [12،13]. كما أُجري اختبار "كا مربع (Chi-square) " لتقييم الدلالة الإحصائية للارتباط بين الإيجابية المصلية للملوية البوابية وحالة فقر الدم، مع تحديد مستوى الدلالة عند قيمة ($p < 0.05$) [7،8].

النتائج :بلغ معدل الانتشار المصلي الإجمالي للملوية البوابية 55% (العدد = 55). ووُجِد معدل انتشار مصلي أعلى بكثير وبفارق جوهري في مجموعة فقر الدم (85.7%، العدد = 18) مقارنة بمجموعة غير المصابين بفقر الدم (46.8%، العدد = 37) [7]. وتبين أن الارتباط بين الإيجابية المصلية لجرثومة المعدة والإصابة بفقر الدم دال إحصائياً بصورة قوية (\chi^2(1) = 11.83, p < 0.001) [7،8].
الاستنتاج :تظهر هذه الدراسة وجود ارتباط قوي وذو دلالة إحصائية عالية جداً بين عدوى الملوية البوابية وفقر الدم [6-8]. وتشير النتائج إلى أن بكتيريا الملوية البوابية تُمثل عاملاً رئيسياً من عوامل خطر الإصابة بفقر الدم.

الكلمات المفتاحية: جرثومة المعدة، فقر الدم، الأجسام المضادة من النوع G (IgG) ، صورة الدم الكاملة (CBC)، الانتشار المصلي.

Introduction:

Helicobacter pylori (*H. pylori*) is a Gram-negative bacterium that colonizes the human stomach and is a major cause of chronic gastritis, peptic ulcers, and gastric cancer. Beyond its well-established gastrointestinal effects, H. pylori infection has been linked to various extra-gastric manifestations, with anemia—particularly iron deficiency anemia (IDA)—being one of the most significant [1]. Anemia is a global health issue, affecting an estimated two billion people worldwide, and IDA accounts for about 50% of these cases [2]. The prevalence of *H. pylori* infection is also remarkably high, affecting nearly half of the world's population, with a higher burden in developing countries [3]. The connection between *H. pylori* and anemia is believed to be multifaceted. Proposed mechanisms include chronic blood loss from gastric micro-erosions, reduced iron absorption due to increased gastric pH and decreased ascorbic acid concentration, and an increase in the synthesis of hepcidin, a key regulator of iron metabolism that inhibits iron absorption [4,5]. Given the substantial public health burden of both conditions, understanding the seroprevalence of *H. pylori* among anemic patients is crucial for effective diagnosis, treatment, and public health interventions.

This study aims to investigate this relationship by utilizing serological and hematological methods.

Objective: The primary objective of this study is to determine the seroprevalence of *H. pylori* infection among anemic patients and compare it with the seroprevalence in a non-anemic control group. The specific objectives are as follows: To measure the seroprevalence of *H. pylori*IgG antibodies in anemic and non-anemic participants using Enzyme-Linked Immunosorbent Assay (ELISA) [12,13]. To evaluate hematological parameters, such as hemoglobin (Hb), mean corpuscular volume (MCV), and hematocrit (Hct), in both groups using a Complete Blood Count (CBC) test [14,15]. To analyze the association between H. pylori seropositivity and the presence of anemia [7,8].

Literature Review The relationship between *H. pylori* infection and anemia, especially iron deficiency anemia, is well-documented in academic literature [6]. Numerous studies have consistently reported a higher prevalence of H. pylori in individuals with anemia compared to non-anemic controls. A meta-analysis by Hudak et al. found that individuals with *H. pylori* infection had a 1.72 times higher risk of developing IDA compared to uninfected individuals [7]. Another meta-analysis showed a pooled odds ratio of 2.8 for the association between *H. pylori* infection and reduced iron stores [8]. Several studies have demonstrated that the eradication of *H. pylori* can improve hematological parameters and normalize iron levels without the need for additional iron supplementation [9,10]. This suggests a causal link and highlights the importance of screening for *H. pylori* in cases of unexplained or refractory anemia. For instance, a case report by Blecker et al. documented that an adolescent girl with IDA experienced a full recovery of her hemoglobin levels after *H. pylori* eradication alone [11]. The serological detection of H. pylori antibodies, particularly IgG, is a widely used non-invasive method for diagnosing infection [1]. ELISA kits for *H. pylori*IgG antibodies offer high sensitivity and specificity, typically around 90%, and are a valuable tool for epidemiological studies and screening [12]. However, it is important to note that a positive IgG result indicates past or current infection, as antibodies can persist for a long time even after successful eradication [13]. Therefore, a positive serology result requires careful interpretation in the clinical context. The Complete Blood Count (CBC) is a standard laboratory test essential for diagnosing and classifying anemia. It provides critical information on red blood cell (RBC) count, hemoglobin concentration, and hematocrit, which are key indicators of anemia [14]. The CBC also includes red cell indices, such as Mean Corpuscular Volume (MCV), which helps differentiate between different types of anemia, such as microcytic anemia, which is often associated with IDA [15].

Material and methods

This was a cross-sectional study conducted to determine the seroprevalence of H. pylori among anemic and non-anemic patients. The samples were collected and analyzed from January to March 2025. The study was carried out in Tarhuna city.

Study Population: 100 adult patients (18 years and older) with a confirmed diagnosis of anemia, as defined by World Health Organization (WHO) criteria (Hb< 12 g/dl for women and Hb< 13 g/dl for men), were enrolled. Inclusion criteria: Participants in this study were anemic or non-anemic based on WHO guidelines and provided informed consent.

Exclusion criteria: Patients who had received treatment for *H. pylori* in the past six months, those with other known causes of anemia (e.g., chronic disease, thalassemias, acute blood loss), pregnant women, and individuals on blood-altering medications were excluded. Data Collection and Laboratory Procedures

1. Demographic and clinical data: A structured questionnaire was used to collect data on age, gender, and any gastrointestinal symptoms.
2. Blood sample collection: Approximately 5 ml of venous blood was collected from each participant. The blood was divided into two tubes: EDTA tube: A portion of the blood was placed in an EDTA tube for immediate CBC analysis [14]. Clot activator tube: The remaining blood was placed in a clot activator tube and allowed to clot. The serum was then separated by centrifugation and stored at -20°C until H. pylori IgG testing could be performed [12,13].
3. Hematological analysis: A Complete Blood Count (CBC) was performed on the EDTA blood sample using an automated hematology analyzer (Mindray BC-3000 Plus) to measure Hb, MCV, Hct, and other hematological indices [14,15]. Anemia and its classification (e.g., microcytic, normocytic) were determined based on the results.
4. Serological analysis: The seroprevalence of *H. pylori*was determined by a quantitative ELISA for the detection of IgG antibodies in the separated serum samples. The assay was performed according to the manufacturer's instructions [12,13]. A sample was considered seropositive if its optical density (OD) fell within the positive range as specified by the kit's cut-off value. Statistical Analysis Data were entered and analyzed using a statistical software package (SPSS version 21). Descriptive statistics were used to summarize demographic and clinical data. The Chi-square ($\chi 2$) test or Fisher's exact test was used to compare the prevalence of H. pylori infection between the anemic and non-anemic groups [7,8]. Logistic regression analysis was performed to determine the association between anemia and *H. pylori*seropositivity, adjusting for potential confounders such as age and gender. A p-value of <0.05 was considered statistically significant.

Results and discussion

Results: The study included 100 participants, with 21 identified as anemic and 79 as non-anemic. Of the total participants, 55 (55%) tested positive for H. pylori IgG antibodies [1].

Table 1: Demographics and Seroprevalence of *H. pylori*

Group	Number (N)	Status	*H. pylori* Seropositivity
Cases	21	Anemic	18 (85.7%)
Controls	79	Anemic Non-anemic	37 (46.8%)
Total	**100**		**55 (55.0%)**

As shown in Table 1, the seroprevalence of H. pylori was significantly higher among anemic patients compared to the non-anemic control group [7].

Table 2: Hematological Parameters and H. pylori Seropositivity

Parameter	Anemic Patients (n=21)	Non-Anemic Patients (n=79)	*p*-value
Hemoglobin (g/dL)	9.8 ± 1.2	14.5 ± 1.5	< 0.001
MCV (fL)	75.3 ± 5.8	90.1 ± 4.2	< 0.001
H. pylori Positive	**18 (85.7%)**	**37 (46.8%)**	**< 0.001**
H. pylori Negative	3 (14.3%)	42 (53.2%)	

The mean hemoglobin and MCV values were significantly lower in the anemic group [14,15]. The Chi-square test showed a highly significant association between *H. pylori*seropositivity and anemia ($\chi 2(1) = 11.83$, $p < 0.001$) [7,8].

Discussion: This study reveals a strong and statistically significant association between H. pylori infection and anemia [6,7,8]. The results indicate that the seroprevalence of H. pylori among anemic patients is substantially higher (85.7%) than in the non-anemic group (46.8%). This finding is consistent with a vast body of literature that supports a causal link between *H. pylori* and anemia, particularly iron deficiency anemia [9,10]. The proposed mechanisms for this association are multifaceted and include: Reduced Iron Absorption: *H. pylori* infection leads to chronic inflammation and a decrease in stomach acid (hypochlorhydria) and ascorbic acid (Vitamin C), which are crucial for the conversion of dietary iron from the ferric (Fe3+) to the more absorbable ferrous (Fe2+) state [4]. Chronic Blood Loss: The gastritis and peptic ulcers caused by *H. pylori* can lead to occult gastrointestinal bleeding, contributing to a gradual loss of iron over time [4]. Increased Hepcidin Production: *H. pylori* infection and the associated inflammation can trigger an increase in the liver-produced hormone hepcidin. Hepcidin inhibits iron absorption from the gut and blocks its release from macrophages, leading to functional iron deficiency, even if iron stores are present [5]. The significant difference in hemoglobin and MCV values between the two groups further supports the diagnosis of anemia in the case group and highlights the link to microcytic anemia, which is often a feature of iron deficiency [14,15]. Our findings, with a p-value of less than 0.001, provide strong evidence that *H. pylori* infection is a significant risk factor for anemia in this population. The high seroprevalence observed in the non-anemic group (46.8%) is also notable, reflecting the generally high prevalence of *H. pylori* in the general population [3]. However, the stark difference between the groups underscores the pathogenicity of the bacterium in susceptible individuals or the role of other co-morbid factors. This study's findings have important clinical implications. Given the significant association, physicians should consider screening for *H. pylori* infection in patients with unexplained or refractory anemia. Eradication of the bacteria may be a simple and effective treatment strategy, potentially reversing anemia without the need for prolonged or additional iron supplementation [9,10].

Conclusion

This study provides compelling evidence of a statistical association between Helicobacter pylori infection and anemia [6,7,8]. Our findings indicate a notably higher prevalence of H. pylori in anemic patients compared to their non-anemic counterparts, reinforcing the need to consider this bacterial infection as a potential cause of anemia. The observed association is biologically plausible, as H. pylori is known to cause chronic gastric inflammation and reduce iron absorption, ultimately leading to iron deficiency [4,5]. The results of this study have significant clinical and public health implications. Given the ease of diagnosis and the availability of effective treatment, screening for H. pylori should be considered in the clinical workup for patients with unexplained anemia [9,10]. This proactive approach could lead to more targeted and effective treatment, potentially obviating the need for long-term iron supplementation alone. Further research, including larger-scale studies and randomized controlled trials, is warranted to fully explore the causality.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

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