The Prevalence of *Helicobacter pylori* Infections in Duhok Province, Iraq: A Retrospective Study

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**Abstract**

*Helicobacter pylori* is a spiral-shaped gram-negative human pathogen. It can be considered as one of the most common causes of infections, particularly chronic gastritis in more than half of the worldwide population. The infections by *H. pylori* in adults as well as children continues to be a challenge for all gastroenterologists. This study aimed to investigate the prevalence of *H. pylori* among men, women and children, in addition to evaluate the relationship between the infection and age and gender in Duhok city -Iraq. The data of 200 patients were collected from both Nawroz Hospital and Roj Medical center in Duhok province, during the period from June 2023 to February 2024 and the data were analysed by (SPSS, 2019) with P. value of ≤0.05 was considered, while for age category factor, a significant variation (p<0.01) between observed and expected proportions was considered. This study revealed 126 positive cases (63%), included 64 (72.7%) male and 62 (55.4%) in females. Regarding the age category factor, it is also resulted in a significant variation (p<0.01) between observed and expected proportions according to the studied age categories and the medium age 19-39 years was the most exposed to the *H. pylori* infection with 62 (62.0%) infection positive, while 38 (38.0) as negative (P= 0.003). An equation was derived for prediction by *H. pylori* infections in the future, where the formula summarized the positive forecasting for infection as result of ≥ 1; while the healthy case will be less than 1.

**Introduction**

*Helicobacter pylori* is a spiral-shaped gram-negative human pathogen that colonizes the stomach’s antrum and corpus [1]. It causes widespread infection in almost half (50%) of the global population [2,3]. Since its discovered and with the dramatical progress in diagnosis of gastrointestinal disease, the pathogen can be considered as one of the most common causes of chronic gastritis that affecting more than half of the worldwide population[4]. During 2014–2020, the prevalence of infection in children and adults was higher in low-income and middle-income countries, than in high-income countries[5]. The infections by Helicobacter pylori in children as well as adults continues to be a challenge for all gastroenterologists[6]. *H. pylori* is more prevalence in people living in developing countries according to the socioeconomic status of individuals[7]. Helicobacter pylori is a strongly associated with peptic ulcers and chronic gastritis [8].

In previous and recent studies, due to the complex interactions between the host and pathogen and the treatment fails in about 20% of cases, moral support of the patient by the clinician and information about *H. pylori* infection, are important tools on which the therapeutic success depends [9], it was demonstrated that an enhanced risk of dyslipidemia is associated with the *H. pylori* infection, which can aggrandize the atherosclerosis process [10]. *H. pylori* has developed several strategies such as genetic diversification that may help it to adapt to a new host after transmission, and to different micro-niches within a single host and to changing conditions in the host over time [11]. Since the highest-resistance profile of *H. pylori* was observed so this indicated that routine antimicrobial susceptibility testing against *H. pylori* is crucial better patient management [12]. Some old and new diagnostic methods have reviewed and assessed in addition, the long-term effects of eradication on histologic lesions have been studied in a meta-analysis and the prognostic value of post- treatment in gastric...
mucosa-associated lymphoid tissue lymphoma has been assessed [13]. The group of guidelines for treatment of H. pylori infection were designed and developed to policymakers and clinicians [14]. This study aimed to investigate the prevalence of H. pylori among men, women and children, in addition to evaluate the relationship between the infection and age and gender in Duhok province, Iraq.

**Materials and Methods**

**Study Setting and Design**

This was a hospital-based retrospective study. In total, the study population consisted of 200 consecutive individuals presented various gastrointestinal symptoms and attended two hospitals- Roj medical center (n=100) and Nawroz hospital (n=100) as outpatients during the period from June 2023 to February 2024, in Duhok province.

**Statistical Analysis**

The data submitted to SPSS software [15], for statistical analysis. Frequency and Chi-square test, with P value of ≤0.05 was considered, However, for age category factor, a significant variation (p<0.01) between observed and expected proportions was considered. Spearman correlation and logistic regression were applied to achieve the results. The main factors were gender and age (as category and as continuous), and the main dependent variable was H. pylori infection result (Negative vs. Positive).

**Results**

As shown in the Table 1, the total number of samples is 200, with 126 positive cases (63%) and 74 negative cases (37%). Concerning to gender category the rate of male was (72.7%) more than female rate (55.4%), where the differences between their observed and expected number was significant (p<0.05) Figure 1.

**Table 1: Relation Between H. pylori Infection and the General Characteristics of Students**

<table>
<thead>
<tr>
<th>Results</th>
<th>Negative H. pylori</th>
<th>Positive H. pylori</th>
<th>Total</th>
<th>X² Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>n=74 (37.0 %)</td>
<td>n=126 (63.0 %)</td>
<td>n=200 (100 %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>24 (27.3)</td>
<td>64 (72.7)</td>
<td>88 (44.0)</td>
<td>6.379</td>
<td>0.012</td>
</tr>
<tr>
<td>Female</td>
<td>50 (44.6)</td>
<td>62 (55.4)</td>
<td>112 (56.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age category</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤18 Years</td>
<td>22 (59.5)</td>
<td>15 (40.5)</td>
<td>37 (18.5)</td>
<td>13.97</td>
<td>0.003</td>
</tr>
<tr>
<td>19-39 Years</td>
<td>38 (38.0)</td>
<td>62 (62.0)</td>
<td>100 (50.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-60 Years</td>
<td>12 (22.6)</td>
<td>41 (77.4)</td>
<td>53 (26.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 61 Years</td>
<td>2 (20.0)</td>
<td>8 (80.0)</td>
<td>10 (5.0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi-squared test was performed for statistical analyses.

**Figure 1: Negative vs. Positive Cases of H. pylori Base on Gender**
Regarding the age category factor, it is also resulted in a significant variation (p<0.01) between observed and expected proportions according to the studied age categories (Table 1), and as shown in the same mentioned Table, the medium age (19-39 years) is the most exposed to the H. pylori infections (62%), followed by higher age (40 – 60 years) which was 41% with P= 0.003 over all age categories. While in children having less or equal 18 years, it was 15% according to positive cases Figure 2. However, Table 1 shows frequency and percentage of both negative and positive cases of H. pylori infection, based on gender and age category. Moreover, it could be noticed that Chi-square value of gender factor (6.379) is significant (p<0.05); that is mean, the observed and expected percentages of negative and positive cases are different significantly between both sexes; where the positive cases surpassed negative ones. Furthermore, Figures (1 & 2) illustrating the wide mentioned variations.

**Table 2: Correlation Coefficient Between Result and Both Studied Factors**

|             | Gender  | Age Category | Result (-/+  
|-------------|---------|--------------|----------------
| Spearman’s rho | 1.000   | .037         | -.179*         
| Gender      | .037    | 1.000        | .260**         
| Age Category| -.179*  | .260**       | 1.000          

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

It could be observed from Table 3, that gender is correlated significantly (p<0.05) and negatively with the result of infection, that is mean males having fewer negative cases. Also, age category is associated significantly (p<0.01) and positively with the result of infection, that is mean with increasing the age, the positive infection cases are increased.

**Logistic regression**

Table 3, presents the logistic regression analysis, and illustrating the significant (p<0.01) effect of age (years) on the infection; also, the effect of intercept (constant) is significant (p<0.05). Such as result ensure that the H. pylori infection, based on gender and age category. Moreover, it could be predicted for H. pylori infections by the following model;

\[
\text{Possible H. pylori infection} = 0.04 \times (\text{age}) - 0.699
\]

However, if the value from the above equation resulted in negative or less than 1, then the result should be negative, but if the value is ≥ 1, then the result should be positive.

Moreover, the lower and upper expected values of infection ranged from (1.02 – 1.062) as shown in Table 3 (with confidence interval – 95 %).
Table 3: Logistic Regression Analysis for H. pylori Infections as Depending on Age of Students

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.040</td>
<td>.010</td>
<td>14.652</td>
<td>1</td>
<td>.000</td>
<td>1.041</td>
<td>1.020 - 1.062</td>
</tr>
<tr>
<td>Constant</td>
<td>- .699</td>
<td>.344</td>
<td>4.123</td>
<td>1</td>
<td>.042</td>
<td>.497</td>
<td></td>
</tr>
</tbody>
</table>

a. Variable(s) entered on step 1: Age; Chi-square value = 16.54 (p<0.001)

Discussion

Many researchers have proven that the infections of H. pylori may have serious health and the major those infections are chronic such as peptic ulcer disease [16]. The prevalence of H. pylori is probably 44.3% of the entire human population which it is 34.7% in developed countries and 50.8% in developing countries, and the outcome of infection depends mainly on the interactions among H. pylori, the stomach, and the environment [17], so that poor socioeconomic factors, hygiene, eating processed food, meat, and unfiltered water have been the major contributing factors to H. pylori infection and its complications [8]. The overall H. pylori infection rate among children and adults in Iran was estimated as of 54% [18]. The majority of isolates from 135 endoscopy-examined patients (24/135) were (71% of 17/24) from males, while only 29% of 7/24) were from females [12]. In study of Al-Kadassy et al. [19] which carried out in Yemen, the prevalence rate of H. pylori infection Among positive results, 31(30.4%) were males and 71(69.6 %) were females. In another study in Erbil the largest proportion (39.4%) of the sample was in the age group 30-49 years, and more than half (53.2%) of the sample were males [4], in another study carried out in Pakistan the majority of infected individuals were males 79 (29.4%) compared to females 34 (14.3%), with statistically significant differences P value=0.000 [2], which not similar to the present study. The current study has found that the lowest rate of infections of H. pylori in children less and equal to 18 years as 15% according to positive cases; while the age category (19-39 years) was recorded the highest percentage (62%), followed by age (40 – 60) which was 41% with P= 0.003 overall age categories, so these results extremely consistency with the study of Al-Brefkani et al.[20] about the prevalence of H. pylori among children in Duhok province which conducted that the infection rate significantly increased with increasing age of the participants (P < 0.001), from 19.8% among four to five-year olds to 42.9% among 16 and 18-year olds, further our results rather agree with the results presented in in study of prevalence of H. pylori among children in Iran [21], besides, consistency with results and application according to the logistic regression in the current study. In study of Saif et al.[22] which carried out among resettled refugees in USA, where the prevalence of H. pylori concerning to age group were as follow: under 18 (11%), 18 – 39 (59%), 40 – 64 (28%) and over 65 (1.1%) while concerning to gender so in males were 40% and females 60%, so compared with these results nearly agree our results, but in contrast no similar in males and females. The results in the present study again are similar in prevalence of H. pylori infections related to gender in study of Ismail et al. [23] which carried out in Lebanon where in males higher than females. Conversely, the results in current study inconsistent to the results of Khoder et al. [24] in Lebanon, where the rate of infections in males was (25%) and females (37%) while rather agree with our study in the rate of infections in age category above 30 years. Furthermore, our results nearly similar in the prevalence of infections age groups whereas by contrast the results are disagree in the rates of infections in males and females some Iraqi studies, where in our results the rate of males higher than females, but in study of Albadri [25] and the study of Majeed & Khoshnaw [26] the rates of infections were higher in females than males. In the final analysis, these differences among the rates of infections in males and females may as a result of the effect of socioeconomic situations, the geographical area, the level of education and the life style according to many research in the developing and developed countries, as exemplified by the research of Ozaydin et al. [27], Eshraghian [28], Alsuulaimany et al. [29], Balas et al. [30], Niknam et al. [31], (Khoder et al. [32], Alfaray et al. [33].

In the current study, the small size and shortage of the data with lack of other socioeconomic factors may affect the accuracy and outcome of the findings. Regardless of the limitations, this study about H. pylori infection is the one of the first studies carried out in Duhok province in Iraq, so it added more to our knowledge about the prevalence and distribution in this region.

Conclusion

An equation was derived for prediction by H. pylori infections in the future, where the formula summarized the positive forecasting for infection as result of ≥ 1; while the healthy case will be less than 1. In another word, if the value from the equation resulted in negative or less than 1, then the result should be negative, but if the value is ≥ 1, then the result should be positive.

Ethical Consideration
Consents from the study participants were obtained verbally, and the study protocol was reviewed and approved by The Scientific and Research Ethics Committee in the Ministry of Health Duhok Directorate General of Health, University of Duhok and Duhok Polytechnic University.

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Conflict of Interest

The author declare that they is no conflict of interests.

References


