

# Relation between ABO blood groups and *Helicobacter pylori* infection in symptomatic patients

Mohamad Salih Jaff

Pathology Department, College of Medicine, Hawler Medical University (formerly Salahuddin University), Erbil, Kurdistan Region, Iraq

**Abstract:** Epidemiological studies have demonstrated higher frequencies of the O blood group and the nonsecretor phenotype of ABH antigens among patients suffering from peptic ulcers. Since *Helicobacter pylori* has been established as the main etiological factor in this disease, controversies about the associations of the ABO and Lewis blood group phenotypes and secretor and nonsecretor phenotypes in relation to susceptibility towards infection by this bacillus have been presented. The aim of this study was to verify the frequencies of ABO and Rhesus (Rh) blood groups in *H. pylori* seropositive symptomatic patients. The study included (n = 1108) patients with dyspepsia symptoms referred from an outpatient clinic in Erbil city for investigation. Age, sex, and residency were recorded as a routine laboratory framework. Patients underwent SD Bioline (Standard Diagnostics Inc, Kyonggi-do, South Korea) and enzyme-linked immunosorbent assay serologic tests for *H. pylori*. ABO blood group phenotypes were determined by a standard hemagglutination test. Results showed that 64.8% of patients (n = 718/1108) were seropositive for *H. pylori* infection, and (35.2%) (n = 390/1108) were seronegative. Of the seropositive patients, 40.8% (n = 293/718) were male and 59.2% (n = 425/718) were female; while of the seronegative patients, 46.7% (n = 182/390) were male and 53.3% (n = 208/390) were female. The mean age for seropositives and seronegatives was (38.0 ± 14.6) years and (37.6 ± 15.7) years respectively. The frequency of the ABO and Rh-positive (Rh+) blood groups among seropositive patients was (A = 32.0%, B = 19.5%, AB = 6.7%, O = 41.8%, and Rh+ = 92.5%) and was (A = 32.3%, B = 28.2%, AB = 8.0%, O = 31.5%, and Rh+ = 92.5%) in seronegatives. The results of this study suggest that ABO blood groups, age, and gender influence seropositivity for *H. pylori* infection.

**Keywords:** age, sex, prevalence, seropositive, *H. pylori*

## Introduction

The association of ABO blood groups with some infectious and noninfectious diseases has been described.<sup>1,2</sup>

Before *Helicobacter pylori* identification as the main etiology of peptic ulcers, chronic gastritis, and a variety of gastrointestinal symptoms,<sup>3-5</sup> many epidemiologic studies had found that nonsecretors of ABO blood group antigens and individuals of blood group O were overrepresented among patients with peptic ulcers.<sup>6-8</sup>

These studies encouraged many researchers to investigate the relation between ABO blood groups and their secretor status with peptic ulcer. Many authors report an association between blood group O and *H. pylori* infection,<sup>9-13</sup> while others failed to find such an association.<sup>14-16</sup>

Many methods are used in clinical practice to diagnose *H. pylori* infection, including measurement of serum immunoglobulin G (IgG) antibodies by enzyme-linked

Correspondence: Mohamad Salih Jaff  
25 Engineering College Staff House,  
Kirkuk Street, Erbil,  
Kurdistan Region, Iraq  
Mobile +964 750 477 7683  
Email msjaff@yahoo.com

immunosorbent assay (ELISA)<sup>17</sup> and Helisal rapid blood (HRB) test, which is a reliable, rapid, and inexpensive screening test of *H. pylori* used in epidemiological studies with greatest usefulness as a primary office diagnostic device.<sup>18</sup>

There were no local data on the epidemiology of *H. pylori* infection in the Kurdistan region of Iraq; therefore, the aim of this study was to verify the incidence of seropositive *H. pylori* infection among patients with dyspepsia symptoms and to verify the frequencies of ABO blood groups in *H. pylori* seropositive symptomatic patients.

## Subjects and methods

### Subjects

From February 2010 to March 2011, a total of 1108 patients with the symptoms of dyspepsia or other symptoms referable to the proximal alimentary tract, from an enterology outpatient clinic, were referred for serologic diagnosis of *H. pylori* infection. The study was performed according to the local Ethical Committee of Medical Sciences.

From each patient, a sample of 3 mL of peripheral blood was collected and centrifuged, and the sera were separated for use.

### Methods

This study was a prospective study of patients attending the outpatient clinic for symptoms of dyspepsia for the first time, with no previous history of *H. pylori* infection and treatment. The study population was screened for *H. pylori* infection by SD Bioline *H. pylori*, a rapid HRB kit (MT Promed Consulting GmbH, Ingbert, Germany) to receive treatment. For this research purpose, the positive SD Bioline *H. pylori* screening test results were confirmed, by estimating the serum levels of anti-*H. pylori* IgG, using the commercial ELISA (Trinity Biotech, Wicklow, Ireland).<sup>17</sup> The results by this method were obtained as immune status ratio (ISR), and values of  $\geq 1.1$  were considered positive. Those patients who were positive for *H. pylori* infection by both methods were included in the seropositives, those who were negative by both methods were regarded as seronegative, and the rest ( $n = 38$ ) were not included within the total study population ( $n = 1108$ ).

ABO and Rhesus (Rh) blood groups were determined for seropositive and seronegative patients, using standardized hemagglutination methods.

The results of this study (seropositives) were compared with the seronegative patient group and with the author's previous study on the ABO blood group frequency in the region,<sup>19</sup> as controls for both age and sex, and blood groups.

## Statistical analysis

Data generated from this study were analyzed using Statistical Package for Social Sciences (SPSS) (Chicago, IL). Chi square test was used to detect statistically significant differences among variables. *P*-values  $< 0.05$  were considered significant.

## Results

The seropositivity for *H. pylori* infection was present in 718/1108 (64.8%) and absent in 390/1108 (35.2%) of these patients (by both methods). Only in 38 patients, there was disagreement between two tests (ie, an agreement of 95%), and these patients were not included in the study population.

The mean age of seropositive patients was ( $37.99 \pm 14.6$ ) years (range, 18–82 years), with a median age of 38.4 years and no significant difference from the mean age of seronegatives ( $37.6 \pm 15.7$ ) years (range, 18–70 years). There was a significant increase in the incidence of seropositivity up to the age of 31 years ( $r = 0.91$ ,  $P = 0$ ) (Figure 1) then a significant decline in the incidence above the age of 31 years ( $-r = -0.94$ ,  $P = 0$ ).

Of these 718 seropositive patients, 37.7% (271/718) were male (M) and 62.3% (447/718) were female (F) (M/F ratio 0.61:1.0). A significant difference was observed when comparing gender in *H. pylori* infection ( $P < 0.0001$ ) with that of the general population (M/F ratio, 1.14:1.0) (Table 1) and with seronegative patients (M/F ratio, 1.2:1.0) (Table 2) but to a lesser degree ( $P = 0.0148$ ).

When the frequencies of blood group phenotypes were analyzed separately in the seropositive patients, seronegative patients, and the general population, it was possible to verify that the frequency of blood group O in seropositive patients was higher and blood group B was lower than in the general population and to a lesser degree in seronegative patients.

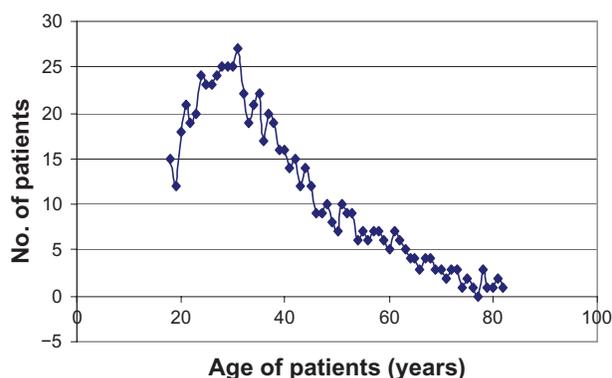


Figure 1 *Helicobacter pylori* seropositivity in patients of different ages.

**Table 1** Gender and blood group relation to *Helicobacter pylori* infected patients compared with the general population

Characteristic	Seropositive N = 718/1108 (64.8%)		General population <sup>14</sup> N = 53,234		P-value
Sex (M/F)	293/425	0.69:1.00	28379/24855	1.14/1.00	0.0001
	M: 40.8%		M: 53.3%		
	F: 59.2%		F: 46.7%		
<b>Blood group</b>					
A	230	32.0%	17,283	32.47%	0.811
B	140	19.5%	12,693	23.84%	0.007
AB	48	6.7%	3475	6.53%	0.880
O	300	41.8%	19,783	37.16%	0.011
Rhesus positive	664	92.5%	48,833	91.73%	0.497
Rhesus negative	54	7.5%	4401	8.27	0.497
Total	718		53,234		

**Abbreviations:** F, female; M, male.

ABO and Rh blood group frequencies in seropositive and seronegative patients are shown in Tables 1 and 2.

These differences between the higher prevalence of type O and the lower prevalence of blood group B in the seropositive patients compared with that in the general population were statistically significant, with *P*-values of 0.01 and 0.007 respectively, and also when compared with that in seronegative patients with *P*-values of 0.0397 and 0.0495 respectively.

No significant differences in the frequency of ABO and Rh blood groups were observed in different ages in seropositive patients. There was also no significant difference in Rh+ frequency between seropositive patients, seronegative patients, and the general population (Tables 1 and 2).

## Discussion

Results of this study showed a significant association between the O blood group and infection caused by *H. pylori* (*P* = 0.01), a finding which is reinforced by data obtained from many other studies.<sup>9–13</sup>

Blood group B patients in this study were less prone to *H. pylori* infection than other blood groups (*P* = 0.007) – a finding not observed in other studies, to the best of the author's knowledge. In another study, AB blood group individuals were less prone to *H. pylori* infection.<sup>9</sup>

The findings of this present study support the epidemiological view of the greater susceptibility of blood group O to infection by *H. pylori*, as well as support the conclusions of Alkout et al,<sup>20</sup> who demonstrated that the H antigen represents an important receptor expressed in the gastroduodenal mucosal cells to which *H. pylori* adheres. The findings of this present study disagree with some previous studies which demonstrated that the O blood group did not represent a risk factor for *H. pylori* infection.<sup>15–17</sup>

In the author's view, this discrepancy could be the result mainly of the type of the control population they used and/or to the surveys which were done in asymptomatic individuals<sup>16,20,21</sup> rather than symptomatic patients.

**Table 2** Gender and blood group relation to *Helicobacter pylori* infection in seropositive patients compared with seronegative patients

Characteristic	Seropositives N = 718/1108 (64.8%)		Seronegatives N = 390/1108 (35.2%)		P-value
Sex (M/F)	293/425	0.69:1.00	213/177	1.2/1.0	0.0148
	M: 40.8%		M: 54.6%		
	F: 59.2%		F: 45.4%		
<b>Blood group</b>					
A	230	32.0%	126	32.3%	0.936
B	140	19.5%	110	28.2%	0.0495
AB	48	6.7%	31	8.0%	0.663
O	300	41.8%	19,783	31.5%	0.0397
Rhesus positive	664	92.5%	349	89.5%	0.288
Rhesus negative	54	7.5%	41	10.5%	0.288
Total	718		390		

**Abbreviations:** F, female; M, male.

This present study used two methods to diagnose *H. pylori* infection serologically to avoid, at least to some extent, some other authors' claims that this discrepancy could be due to different methods used to detect *H. pylori* infection.<sup>15–17,22</sup>

For example, some authors who have used polymerase chain reaction (PCR) stress that other tests employed in the diagnosis of *H. pylori* infection differ in specificity and sensitivity from the PCR method, and may have an influence on the different infection frequencies observed within distinct populations.<sup>23,24</sup>

It is the present author's view that the higher susceptibility of O blood group individuals to *H. pylori* infection is most probably due to the higher frequency of secretor status in O blood group individuals.<sup>25</sup> This view is supported by a previous demonstration, by Alkout et al, that H antigen represents an important receptor expressed in the gastroduodenal mucosal cells to which *H. pylori* adheres,<sup>20</sup> which also enhances colonization of *H. pylori* bacteria.<sup>26</sup>

The support to the above view is that the ABH and Lewis (Le) antigens on the gastric and duodenal mucosa are synthesized through a specific glycosyltransferase from the basic H substance, and the O and Le (a– b+) phenotypes (secretors) express a greater quantity of these basic fucosylated antigens,<sup>27</sup> in comparison with other groups, as Borén et al speculated later on.<sup>8</sup>

Blood group O individuals express a higher inflammatory responses to *H. pylori* with higher levels of lymphocyte infiltration in the gastrointestinal mucosa,<sup>20,26,28</sup> a lower level of Von Willebrand's factor,<sup>29,30</sup> and a higher frequency of secretor status;<sup>25</sup> all these together, in the view of the present author, explain these individuals' increased susceptibility to peptic ulceration.

Regarding Rh status, this present study showed no significant differences between the seropositive patients, seronegative patients, and the general population, which is in an agreement with previous studies.<sup>31</sup>

The prevalence of seropositivity will change between countries and within the same country, according to the socioeconomic status, being higher among groups with lower socioeconomic status.<sup>32,33</sup> In this study, the prevalence of seropositivity to *H. pylori* infection was (64.8%) in symptomatic patients in the Kurdistan region of Iraq, which is higher than the average prevalence in the world's population (50%).<sup>34–36</sup> It was in between the high prevalence in some developing countries (80%–90%) and the low prevalence in some developed countries (<40%),<sup>37,38</sup> eg, 35%–40% in the United States,<sup>39</sup> while it was similar to those in the neighboring countries and some other countries, eg, Turkey<sup>40</sup>

(68%), Saudi Arabia<sup>41</sup> (61%), Kuwait<sup>42</sup> (62%), some regions in Iran<sup>43,44</sup> (66.7% to >85%), and Brazil<sup>23</sup> (61.7%).

In this study, more females than males were seropositive ( $P = 0.0001$ ), as seen by some other studies,<sup>9,39</sup> while some other studies have noticed no such relation to gender<sup>31,32,40,42,43</sup> and some have even noticed a higher prevalence of *H. pylori* in men.<sup>45,46</sup> The differences in socioeconomic conditions in the studied population and the type of controls used for comparison can explain this discrepancy.

Regarding acquisition of infection, the results of this study suggest that newly acquired *H. pylori* infections had happened during childhood and early adolescence, increasing to reach its peak at adulthood at 31 years with a median age of about 38 years (Figure 1). This present author's observation was in concordance with many other authors' findings.<sup>47–49</sup>

From various studies (including this one), genetic predisposition, as well as environmental factors, are suggested as important influencing factors in *H. pylori* infection, a view supported by the Malaty and colleagues' study on twins.<sup>50</sup>

## Conclusion

From this study, which to date is the only study of this type in the Kurdistan region of Iraq, it can be concluded that *H. pylori* infection is an endemic problem, which should be dealt with by improving sanitation and purified water supply and also should be investigated for and eradicated. It can also be concluded that O blood group individuals are more susceptible to *H. pylori* infection and its symptomatic gastrointestinal complications, and/or they have more cellular and immunological response to it (expressed by seropositivity) than other ABO blood groups (group B in particular), while no significant differences between Rh+ and Rh– patients were seen. Also, it can be concluded that females and adolescents are more prone to *H. pylori* infection.

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## Disclosure

The author is the principal investigator in this study. He takes primary responsibility for the paper, as he was in charge of

the main laboratory works. The author reports no conflicts of interest in this work.

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