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Study of Association between ABO Blood Groups and Helicobacter Pylori Infection among Elderly Egyptian Population

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ABSTRACT

Background: In the elderly stomach, Helicobacter pylori (H. pylori) is a highly common harmful organism. It raises the chance of gastric cancer and atrophic gastritis. High incidence and medication resistance are two characteristics of infection with H. Pylori in older people.

Objective: The study intended to investigate the relationship between infection with Helicobacter pylori in the elderly Egyptian population and ABO blood groups.

Subjects and methods: 600 people who were 65 years of age or older, with any symptoms of dyspepsia, bloating, nausea and vomiting, burping, and loss of appetite, participated in the study. Patients were referred for stool antigen testing to diagnose H. pylori infection. Participants were in two groups Group I: positive stool antigen patients for helicobacter pylori. Group II: negative stool antigen subjects for helicobacter pylori.

Results: The prevalence of H. pylori infection in group I was 40.3% in the A blood group, 27% in the B group, 21.7% in the AB group, and 11% in the O blood group. On the other side group II has a different ABO group rate, it was 36.7% in blood group A, 22.7% in group B, 29% in group AB, and 11.7% in group O. Rh factor was positive 76.7% in Group I, and 69.3% in group II. Rh was negative in 23.3% of Group I and 30.3% of Group II.

Conclusion: Infection with H. pylori in the elderly Egyptian population currently is affected by the Rh factor and not by the patient's ABO blood group.

Keywords: Helicobacter pylori (H. pylori), blood types A, B, O, and AB (ABO group)

INTRODUCTION

A person 65 years of age or older is frequently referred to as elderly since aging is an unavoidable process and is typically defined by chronological age [(1)]. The population aged 60 and older demographic is growing both in size and percentage. In 2019, 1 billion individuals were 60 years of age or older. By 2030 and 2050, this population will increase to 1.4 billion and 2.1 billion, respectively [(2)].

Aging will have a significant impact on several functional organs. A disruption in the digestive system's normal operation may cause indigestion symptoms. Over 40% of outpatients in Italy with a 60+ age range who participated in a survey reported having had gastrointestinal problems [(3)]. The main anatomical and physiological effects of aging on the upper digestive system include gastric mucosa atrophy, decreased stomach and esophageal motility, reduced mucosal blood flow, decreased gastric acid and bile secretion, and decreased activity of digestive enzymes. Aging can also result in digestive problems or a worsening of diseases that were contracted when young, depending on factors including infections, comorbidities, diet, and drugs [(4)].

One of the gastrointestinal diseases that is often limited to the elderly is atrophic gastritis, either with or without pernicious anemia. The cause of this illness may not just be old age, but a persistent H. pylori infection. A non-tapering ectatic submucosal artery that causes a Dieulafoy lesion may be a rare but common source of upper GI hemorrhage in individuals of all ages [(5,6)].

Older people are more prone to developing gastric cancer because of the infection of Helicobacter pylori (H. pylori), which is the most common pathogenic bacteria in the stomach [(7)]. Even though H. pylori can affect people of all ages, infection is more common among the elderly, developing atrophic gastritis and stomach cancer [(8–10)].

The human stomach mucosa is home to the harmful Helicobacter pylori spiral-like Gram-negative bacterium. Although the bacteria are widespread in around 50% of the population of the globe [(11,12)], only 10-15% of infected individuals experience symptoms, such as malignancies of the stomach and peptic ulcers [(13,14)]. The high incidence and medication resistance of H. pylori infection in elderly people define its epidemiology [(15)].

Nitric oxide is overproduced because of H. pylori infection, which also raises the expression of endothelial nitric oxide synthase, and triggers the growth of vessels, which obstructs blood and oxygen flow [(16)]. In elderly individuals, H. pylori infection results in atrophy of the stomach mucosa and disruption of the small blood circulation. Elderly patients' H. pylori infection treatment may reduce their chance of developing stomach cancer. H. pylori testing should be performed for NSAIDs and aspirin users. Eliminating H. pylori infection can stop antiplatelet medication-induced damage to the stomach mucosa [(17-19)].

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H. pylori is often acquired and spread by unknown mechanisms, although intimate human contact is necessary. Past epidemiological research has demonstrated that household hygiene habits and socioeconomic status (measured by job, housing situation, and income level) are significant H. pylori infection risk factors. These components help explain why H. pylori infection rates vary between populations. [20,21].

There is growing evidence that H. pylori infection susceptibility is influenced by genetic factors, even though the majority of the research on H. pylori infection risk factors has concentrated on lifestyle (such as food and smoking) and environmental factors. The ABO blood type is one genetically determined feature that has drawn attention as a possible potential cause for infection with H. pylori due to its polymorphic expression amongst individuals and groups [22-24]. Over the past few decades, epidemiological data and research using animal models have provided new evidence that suggests ABO blood types may operate as possible potential causes of H. pylori infection [25–27].

There have been contradictory researches concerning ABO blood types and the risk of H. pylori-related stomach cancer because of several confounding variables [28].

This study intended to examine the relationship between infection caused by Helicobacter pylori in the elderly Egyptian population and the ABO blood types.

SUBJECTS AND METHODS

600 patients in total from tropical and geriatric outpatient clinics who had reached the age of 65 or more and experienced any dyspepsia symptoms—including bloating, nausea and vomiting, burping, and appetite loss—were sent for stool antigen testing to determine if they were H. pylori-infected. Participants were sorted into two groups: positive patients for the helicobacter pylori stool antigen were in Group I, whereas those who tested negative were in Group II.

The current study excluded patients with hematemesis, melena, prior history of H. pylori infection, or therapy. All participants were asked about their full medical histories.

All patients underwent a complete physical examination, with a focus on the abdomen.

Without ever having had treatment for or an H. pylori infection in the past, the participants in this prospective study were patients who initially presented to the outpatient clinic with symptoms of any described gastrointestinal disorders.

The investigation’s population's infection with H. pylori was assessed by stool antigen.

Using standardized hemagglutination techniques, the ABO blood group and Rhesus (Rh) factor were identified for the positive and negative helicobacter pylori patient groups.

From each patient, five milliliters of whole blood samples were obtained and combined with EDTA in vacuum tubes. By hemagglutinating standard A1 with commercial anti-A, anti-B, and anti-A, B sera for forward typing and B red blood cells for reverse typing, the ABO blood group phenotypes were identified. A drop of each anti-A, anti-B, and anti-A, B sera was mixed with a drop of red blood cell suspension in 5% sterile saline solution (0.9% NaCl) produced specifically for each sample to define the erythrocyte antigens. Two drops of blood plasma from each sample were mixed with one drop of each of the normal 5% A1 and B red blood cells to detect the anti-A and anti-B antibodies. The presence or absence of hemagglutination was utilized to interpret the results after the tubes were centrifuged at 3400 rpm for 1.5 minutes. According to the manufacturer's instructions, each reagent was utilized. (CTK Biotech, Inc.10110 Mesa Rim Road San Diego, CA 92121,USA)

Ethical approval:

The ethics of the Declaration of Helsinki were followed in the conduct of the study, and on July 21, 2022, Alexandria University's Faculty of Medicine's Ethical Committee gave its clearance with the serial number 0305647. All patients gave their informed permission.

Statistical Analysis

The IBM SPSS software package, version 23.0, was used for statistical analysis. With categorized information, comparisons across groups were evaluated utilizing Chi-Square test or Fisher exact test. Mann-Whitney test was used to compare two groups of non-normally distributed quantitative data. The 5% level was used to assess the importance of the data obtained.

RESULTS

Table [1] displays the participants characteristics of this research. Blood type A had the highest incidence of infection by H. pylori in group I (40.3%), followed by blood groups B (27%), AB (21.7%), and O (11%). Although the variation in the ABO group percentage was found between groups I and II, no statistically significant difference was discovered. On the other hand, group II had a distinct ABO group rate of 36.7% for A blood group, 22.7% for B blood group, 29% for AB group, and 11.7% for O blood group.

Table [1]: Comparison of the two groups across several parameters

	Group I (n=300)		Group II (n=300)		Test of sig.	p-value
	No	%	No	%		
Gender						
Female	156	52%	151	50.3%	$\chi^2 = 0.167$	0.683
Male	144	48%	149	49.7%		
Dyspepsia						
Absent	5	1.7%	300	100.0%	$\chi^2 = 580.328$	<0.001*
Present	295	98.3%	0.0	0.0%		
Nausea						
Absent	100	33.3%	300	100.0%	$\chi^2 = 300.00$	<0.001*
Present	200	66.7%	0.0	0.0%		
Vomiting						
Absent	191	63.7%	300	100.0%	$\chi^2 = 133.198$	<0.001*
Present	109	36.3%	0.0	0.0%		
Anorexia						
Absent	141	47.0%	300	100.0%	$\chi^2 = 216.327$	<0.001*
Present	159	53.0%	0.0	0.0%		
Splenomegaly						
Absent	300	100.0%	300	100.0%	-	-
Present	0.0	0.0%	0.0	0.0%		
Hepatomegaly						
Absent	300	100.0%	300	100.0%	-	-
Present	0.0	0.0%	0.0	0.0%		
Jaundice						
Absent	300	100.0%	300	100.0%	-	-
Present	0.0	0.0%	0.0	0.0%		
ABO						
A	121	40.3%	110	36.7%	$\chi^2 = 4.901$	0.179
B	81	27.0%	68	22.7%		
AB	65	21.7%	87	29.0%		
O	33	11.0%	35	11.7%		
Rh						
Positive	230	76.7%	208	69.3%	$\chi^2 = 4.093$	0.043*
Negative	70	23.3%	92	30.7%		
CBC						
HGB	13.0(12.0-14.0)		13.0(12.0-14.0)		U = 42705.0	0.276
WBCS	6.40(5.5-7.8)		6.0(5.0-7.7)		U = 40284.5*	0.026*
Platelets	277.0(233-35.5)		278.0(235.5-350)		U = 44263.0	0.728
Liver function						
AST	23.0(17.0-26.0)		22.0(15.0-25.5)		U = 40598.0*	0.038*
ALT	22.0(17.0-25.0)		20.0(16.0-23.0)		U = 38494.0*	0.002*
Renal function						
Urea	32.0(24.0-34.0)		32.0(24.0-35.0)		U = 43610.0	0.511
S. creatinine	0.70(0.60-0.90)		0.60(0.50-1.0)		U = 38121.5*	0.001*

Qualitative parameters were expressed as number and percent, non-normal distributed quantitative parameters were expressed as median (interquartile range).

χ^2: Chi-square *: Statistically significant, U: Mann Whitney test FE: Fisher Exact

In table [2] , Rh was positive for Group I in regard to the various ABO groups in 41.7% of Group A, 27% of Group B, 20% of Group AB, and 11.3% of Group O. In 35.7% of Group A, 27.1% of Group B, 27.1% of Group AB, and 10% of Group O, Rh was negative. When examining the relation between Rh and other ABO groups in group I, it showed no difference of statistical significance.

Table [2]: Rh and several group I factors in relation to each other.

	Rh					
	Positive (n=230)		Negative (n=70)		Test of sig.	p-value
	No	%	No	%		
Gender						
Female	127	81.4%	29	18.6%	χ^2= 4.088	0.043*
Male	103	71.5%	41	28.5%		
Dyspepsia						
Absent	4	1.7%	1	1.4%	χ^2=0.032	^{FE}p = 1.000
Present	226	98.3%	69	98.6%		
Nausea						
Absent	78	33.9%	22	31.4%	χ^2=0.149	0.699
Present	152	66.1%	48	68.6%		
Vomiting						
Absent	141	61.3%	50	71.4%	χ^2=2.378	0.123
Present	89	38.7%	20	28.6%		
Anorexia						
Absent	106	46.1%	35	50.0%	χ^2=0.330	0.556
Present	124	53.9%	35	50.0%		
Splenomegaly						
Absent	230	100%	70	100%	-	-
Present	0	0.0%	0	0.0%		
Hepatomegaly						
Absent	230	100%	70	100%	-	-
Present	0	0.0%	0	0.0%		
Jaundice						
Absent	230	100%	70	100%	-	-
Present	0	0.0%	0	0.0%		
ABO						
A	96	41.7%	25	35.7%	χ^2=1.830	0.608
B	62	27.0%	19	27.1%		
AB	46	20.0%	19	27.1%		
O	26	11.3%	7	10.0%		
CBC						
HGB	13.0(12.0-14.0)		13.0(12.0-13.8)		U = 7758.5	0.643
WBCS	6.4(5.0-7.7)		6.6(5.7-8.0)		U = 7180.0	0.169
PLATELETS	277.0(239-355)		283.5(223-350)		U = 7797.0	0.690
Liver function						
AST	23.0(16.0-25.0)		22.0(19.0-29.0)		U = 7119.5	0.142
ALT	22.0(17.0-24.0)		22.5(17.0-26.0)		U = 7276.0	0.222
Renal function						
Urea	32.0(24.0-34.0)		30.5(23.0-3.0)		U = 7581.5	0.459
S. creatinine	0.70(0.60-0.90)		0.70(0.70-.90)		U = 7325.0	0.245

In Table [3] Rh was positive for Group II in regard to the various ABO groups in 37% of Group A, 25.5% of Group B, 27.4% of Group AB, and 10.1% of Group O. 35.9% of Group A, 16.3% of Group B, 32.6% of Group AB, and 15.2% of Group O had negative Rh results. When examining the link between Rh and other ABO groups in group II patients, it showed no statistically significant difference.

Table [3]: Rh and several group II factors in relation to each other

	Rh					
	Positive (n=208)		Negative (n=92)		Test of sig.	p-value
	No	%	No	%		
Gender						
Female	95	63.8%	54	58.7%	χ^2= 4.327	0.038*
Male	113	74.8%	38	41.3%		
Dyspepsia						
Absent	208	100%	92	100%	-	-
Present	0	0.0%	0	0.0%		
Nausea						
Absent	208	100%	92	100%	-	-
Present	0	0.0%	0	0.0%		
Vomiting						
Absent	208	100%	92	100%	-	-
Present	0	0.0%	0	0.0%		
Anorexia						
Absent	208	100%	92	100%	-	-
Present	0	0.0%	0	0.0%		
Splenomegaly						
Absent	208	100%	92	100%	-	-
Present	0	0.0%	0	0.0%		
Hepatomegaly						
Absent	208	100%	92	100%	-	-
Present	0	0.0%	0	0.0%		
Jaundice						
Absent	208	100%	92	100%	-	-
Present	0	0.0%	0	0.0%		
ABO						
A	77	37.0%	33	35.9%	χ^2= 4.422	0.219
B	53	25.5%	15	16.3%		
AB	57	27.4%	30	32.6%		
O	21	10.1%	14	15.2%		
CBC						
HGB	12.9(12.0-14.0)		13.1(12.0-14.0)		U = 8868.5	0.311
WBCS	6.4(5.0-7.8)		5.9(4.9-7.6)		U = 8668.0	0.193
PLATELETS	267(235.5-352)		288.0(230-350)		U = 8989.0	0.403
Liver function						
AST	22.0(15.0-25.0)		22.0(16.0-28.0)		U = 8828.5	0.285
ALT	19.0(15.0-22.0)		21.0(17.0-26.5)		U = 8155.5	0.041*
Renal function						
Urea	32.0(24.0-35.0)		32.0(26.0-35.0)		U = 8909.5	0.340
S. creatinine	0.60(0.50-1.0)		0.70(0.60-1.0)		U = 8832.5	0.281

DISCUSSION

The most important need for human blood donations is the ABO blood type system. In investigations of connections with infectious and noninfectious disorders, as a genetic marker, this system is used [29].

Recent evidence from several epidemiological surveys and research has raised the possibility that certain ABO blood types may operate as potential causes of H. pylori infection. A number of researchers have found a correlation between infection with H. pylori and having an ABO blood type, whereas other investigations have not found any appreciable correlations [30].

In this study, the link between the ABO group, Rh, and H. pylori, in the senior Egyptian population was investigated. Infection with H. pylori and the ABO blood type antigen did not significantly correlate with one another.

This outcome backs up the conclusions made by **Teshome *et al.*** who discovered that there was no connection between infection with H. pylori and ABO blood type using stool antigen assays [31]. Additionally, this finding is in line with work by **Robertson *et al.***, who observed no connection between individuals' ABO blood types and their H. pylori using serological status, whether they were experiencing symptoms or not [32].

Our findings are in contrast with those of studies by **Chakrani *et al.*** which looked at more than 12,000 people. They investigated how H. pylori infection and ABO blood type are related and found the blood O group was statistically more significantly to have the infection than the non-blood O group by about 16.3%. Comparatively to non-B, non-AB, blood types B and AB showed about 17% and 29% lower risk of infection with H. pylori. When comparing these findings to the overall connection while taking into account the research gap between the developing and the Western worlds, the outcomes failed to differ significantly from the overall relationship [30].

In terms of Rh status, 76.7% of group I patients and 69.3% of group II patients were Rh+. Rh was negative in 23.3% of group I and 30.3% of group II. The statistical difference of three between groups I and II was significant (P-value = 0.043).

The current investigation revealed a variation in Rh status between infected and uninfected individuals, proving that the Rh factor is connected to infection with H. pylori. The findings from a previous analysis by **Petrovic *et al.*** which found no changes between infected and uninfected individuals and concluded that the existence of infection with H. pylori was not affected by the Rh factor, do not support the current findings [33].

CONCLUSION

Infection with H. pylori in the elderly Egyptian population currently is affected by the Rh factor and not by the patient's ABO blood group.

RECOMMENDATIONS

In addition to researching ABO blood grouping and infection with Helicobacter pylori among aged and adulthood Egyptian populations and then comparing the findings, we advise repeating the study with a bigger sample size to confirm our findings.

- **Finances Sponsorship:** None
- **Conflicts of interest:** According to the authors, there are none.

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