The Study of Helicobacter Pylori Infection in Acute Coronary Syndrome Patients

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Abstract

Background: The etiology of acute coronary syndrome (ACS), has been linked to lifestyle risk factors and chronic infections like those caused by Helicobacter pylori. The role of H. pylori, has been investigated in the context of cardiovascular diseases due to its potential involvement in atherosclerotic plaque destabilization.

Objectives: To evaluate the association between H. pylori infection and clinical outcomes in patients presenting with ACS.

Patients and methods: The cohort study involved 100 ACS patients and 50 age-matched healthy controls from Sohag University Hospital. Clinical evaluations, laboratory blood tests, H. pylori antigen testing in stool samples, electrocardiograms, and echocardiography were performed.

Results: The ACS patients had a significantly higher mean age and BMI compared to the control group. H. pylori - infection was detected in 48% of ACS patients compared to 60% in the control group; this difference was not statistically significant ($p>0.05$). The relationship between H. pylori - infection and ACS clinical parameters was not statistically significant ($p>0.05$). Additionally, there were no significant differences between ACS patients with and without H. Pylori regarding cardiac arrest, cardiogenic shock, reinfarction or cerebrovascular stroke (CVS) ($p>0.05$).

Conclusion: The study found no significant differences in the presence of H. pylori infection between ACS patients and healthy controls. Additionally, H. pylori infection did not influence the clinical parameters or outcomes in patients with ACS.

Keywords: Helicobacter pylori; Acute coronary syndromes; Atherosclerosis; Myocardial infarction.

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Introduction

Ischemic heart disease (IHD) emerges as the second most significant contributor to disability-adjusted life years and is a leading factor in premature death. In 2019, IHD was the cause of nearly 9.1 million fatalities, according to the Global Burden of Disease Study, **(Vos et al., 2020)**. Acute coronary syndrome (ACS), encompassing unstable angina, non-ST-segment-elevation myocardial infarction (NSTEMI), and ST-segment-elevation myocardial infarction (STEMI), is particularly notable for its severe mortality risk and profound effects on the quality of life for those who survive among all conditions related to IHD **(Thygesen et al., 2018)**.

Controllable cardiovascular risk factors, including smoking, diabetes, hyperlipidemia, and hypertension, are the leading cause of acute myocardial infarction (AMI), a key aspect of ACS **(Shi et al., 2019)**. Current studies highlight the possible contributory role of chronic infections, such as those caused by the bacterium Helicobacter pylori, in the process of atherosclerosis **(Karbasi-Afshar et al.,2015)**.

Helicobacter pylori (H. pylori) are Gram-negative microaerophilic bacterium and has been acknowledged for its significant role in peptic ulcers, gastric cancer, and chronic gastritis, posing a substantial risk for gastric malignancies across various populations. There is global variation in the prevalence of H. pylori infection which remain elevated in most developing nations while decreasing in those experiencing improvements in living standards **(Hathroubi et al., 2018)**.

Many clinical conditions are linked to H. pylori infection such as gastric intestinal metaplasia, peptic ulcer disease, gastric cancer, and mucosa-associated lymphoid tissue lymphoma **(Bergmark et al., 2022)**. The evidence suggesting that H. pylori may play a role in the destabilization or rupture of atherosclerotic plaques is present, thus elevating the risk of acute cardiovascular incidents **(Aceti et al., 1996)**.

Given the mixed results from various studies exploring the relationship between H. pylori infection and ACS, largely due to limited sample sizes, there is a clear demand for further investigation into this association. Our research is designed to compare the incidence of H. pylori infection in ACS patients with a healthy control group, and assess the complications encountered by infected ACS patients in comparison to those uninfected.

Patient and methods

The study was carried out at Sohag University Hospital, within the realms of the Department of Internal Medicine and the Coronary Care Unit (CCU). Spanning from December 2022 to December 2023. Ethical clearance was meticulously obtained from the Ethics Committee of the Sohag Faculty of Medicine (Soh-Med-23-02-05), ensuring all participants provided informed written consent before their inclusion.

Our cohort comprised 100 patients who were diagnosed with ACS, including instances of STEMI and NSTEMI, as well as unstable angina. 50 age-matched, apparently healthy individuals were also recruited to function as a control group.

The selection criteria for participants were inclusive yet precise. We considered all patients aged 18 years and older, who were admitted with ACS to the CCU, as part of the case group. Exclusion criteria included patients with cardiogenic shock, renal impairment (defined as a creatinine clearance rate

below 60 mL/min), known systemic inflammatory conditions, recent antibiotic in the previous one month or proton pump inhibitor use in the last two weeks, and those with a history of gastrointestinal bleeding.

In terms of methodology, our approach was comprehensive and multidisciplinary. Initial steps involved a thorough clinical assessment of each participant, gathering detailed personal, family, and medical histories, along with a full clinical examination. This assessment aimed to chart a holistic view of the patient's health status, incorporating factors such as age, sex, smoking habits, familial cardiac disease history, and a detailed account of prior medical conditions and treatments. Following the clinical evaluation, laboratory assessments were conducted for a complete blood count, liver function tests, and kidney function tests, providing essential biochemical insights into each participant's health.

H. pylori testing: A pivotal aspect of our methodology was the detection of H. Pylori infection through the analysis of stool samples using rapid test kits. The OnSite H. pylori Ag Rapid Test, a lateral flow chromatographic immunoassay, facilitated a qualitative assessment of H. pylori antigen presence, offering a non-invasive and efficient diagnostic alternative. Rapid lateral flow immunoassay stool antigen (a commercial immunoassay kit from ACON) was used.

Furthermore, diagnostic procedures such as electrocardiograms (ECGs) and echocardiography were integral for identifying ischemic changes and assessing structural heart diseases, respectively, enriching our dataset with critical cardiovascular health indicators.

Statistical analysis

The data were analyzed employing the IBM Statistical Package for Social Sciences software (SPSS), 25th edition, from IBM, United States. The study utilized descriptive statistics to present a comprehensive overview of the data, employing mean±SD for numerical parametric data, median and interquartile range for numerical non-parametric data, and number/percentage for categorical data. For inferential analyses, the independent t-test and Mann - Whitney U test were applied to assess quantitative variables, depending on whether the data was parametric or non-parametric. Additionally, the paired student t-test was employed for comparing related samples, offering insights into potential associations or differences within the data. The significance level was set at a p-value < 0.05, ensuring robust statistical inference.

Results

This study was conducted on 100 patients with ACS and 50 apparently healthy control. The mean age of ACS patients was 60.60± 10.28 years with 68% of them being males. The demographic data of the patients and control groups were presented in table 1. Age and BMI were significantly higher in ACS patients compared to the control group ($p<0.001$and $p=0.002$ respectively). No significant differences were observed between the two studied groups regarding gender ($p>0.05$).

Hypertension and DM were significantly higher in the ACS group compared to the control group ($p<0.001$). No statistically significant differences were observed between the two studied groups regarding smoking ($p>0.05$). Regarding clinical presentation, 62% of the cases in the ACS group had STEMI, 10% of them

had non-STEMI and 28% had unstable angina **(Table 1)**.

Table 1. Demographic characteristics among the studied groups.

Variables		ACS group (No. = 100)		Control group (No. = 50)		Test value	P-value
		No.	%	No.	%		
Gender	**Male**	68	68.0%	31	62.0%	X^2= 0.791	0.374 (NS)
	Female	32	32.0%	19	38.0%		
Age (years)	**Mean± SD**	60.60± 10.28		50.05± 15.97		T= 5.553	<0.001 (HS)
	Range	22.0 - 85.0		20.0 - 85.0			
Age groups	**<50 years**	14	14.0%	23	46.0%	X^2= 25.69	<0.001 (HS)
	≥50 years	86	86.0%	27	54.0%		
BMI (Kg/m2)	**Mean± SD**	26.13± 4.95		24.07± 4.69		^{Z}MWU= 3.136	0.002 (HS)
	Median (IQR)	27 (22- 30)		25 (19- 29)			
	Range	17 – 35		17 – 32			

NS: Non significant, HS: High statistically significant, SD: standard deviation, X^2: Chi- Square test, ZMWU: Mann-Whitney Test and T: Student T Test, BMI : body mass index.

We analyzed the electrocardiogram (ECG) findings in the ACS group; the most prevalent ECG abnormalities observed were ST elevation in 62% of patients, followed by inverted T waves in 33% of patients. Electrocardiographic findings in patients and control groups were presented in **(Table.2)**.

Table 2. Comparison between the two groups regarding ECG.

ECG	ACS group (No. = 100)	
	No.	(%)
NAD	0	(0.0%)
Inverted T wave	33	(33.0%)
ST elevation	62	(61.0%)
Pathological Q	8	(8.0%)
Left BBB	4	(4.0%)
Depressed ST segment	4	(4.0%)
Biphasic T wave	3	(3.0%)
RBBB	1	(1.0%)
Complete heart block	1	(1.0%)

LBBB: left bundle branch block, RBBB: right bundle branch block.

Echocardiography findings showed that almost all cases in the ACS group had segmental wall motion hypokinesia. A statistically significant differences was observed between ACS patients and the control group regarding echocardiography findings (p<0.001) **(Table.3)**.

No significant differences were observed between the ACS group and control group regarding creatinine level (p>0.05). Positive H. pylori in stool were detected in 48% cases in the ACS group and in 60% of cases in the control group. No significant differences were observed between the ACS group and

control group regarding H. pylori in stool (p>0.05). There was no statistically significant relationship between H. pylori infection and different parameters in the ACS group (p>0.05) including gender, age, BMI, hypertension, DM, smoking, presentation, creatinine level, and EF **(Table.4)**.

No significant differences were found between the ACS group with positive H. pylori and the ACS group with negative H. pylori regarding cardiac arrest, cardiogenic shock, reinfarction and CVS (p>0.05) **(Table .5)**.

Table 3. Echocardiography among the studied groups.

Variables		ACS group (No. = 100)		Control group (No. = 50)		Test value	P-value
		No.	%	No.	%		
Echo findings	No significant changes	0	0.0%	50	100.0%	X^2= 208.0	<0.001 (HS)
	Hypokinesia	98	98.0%	0	0.0%		
	Hypokinesia with Akinetic apex	4	4.0%	0	0.0%		
	Akinesia	1	1.0%	0	0.0%		
	Ischemic Dilated Cardiomyopathy	2	2.0%	0	0.0%		
EF (%)	Mean± SD	46.21± 7.38		-			
	Range	29 - 66		-			

NS: Non significant, HS: High statistically significant, SD: standard deviation, X^2: Chi- Square test, EF : ejection fraction.

Table 4. Relation between H. Pylori infection and different parameters in ACS group.

Variables		H. Pylori in stool Patients with ACS				Test value	P-value
		Negative		Positive			
		N	%	N	%		
Gender	Male	38	73.1%	30	62.5%	X^2= 1.283	0.257 (NS)
	Female	14	26.9%	18	37.5%		
Age (years)	Mean± SD	61.40± 9.30		59.73± 11.27		T= 0.813	0.418 (NS)
Age groups	<50 years	5	9.6%	9	18.8%	X^2= 0.002	0.961 (NS)
	≥50 years	47	90.4%	39	81.3%		
BMI (Kg/m^2)	Mean± SD	25.71± 5.14		26.58± 4.73		^{Z}MWU= 0.862	0.389 (NS)
Hypertension	No	29	55.8%	27	56.3%	X^2= 0.002	0.961 (NS)
	Yes	23	44.2%	21	43.8%		
DM	No	33	63.5%	28	58.3%	X^2= 0.276	0.599 (NS)
	Yes	19	36.5%	20	41.7%		
Smoker	No	25	48.1%	26	54.2%	X^2=	0.543 (NS)

	Yes	27	51.9%	22	45.8%	0.370	
Presentation	**Non-STEMI**	4	7.7%	6	12.5%	X^2= 0.822	0.663 (NS)
	STEMI	34	65.4%	28	58.3%		
	Unstable Angina	14	26.9%	14	29.2%		
EF (%)	**Mean± SD**	45.98± 7.72		46.46± 7.07		T= 0.322	0.748 (NS)
Creatinine (mg/dL)	**Mean± SD**	1.01± 0.31		0.91± 0.26		^{Z}MWU= 3.136	0.257 (NS)

NS: Non significant, HS: High statistically significant, SD: standard deviation, X^2: Chi- Square test, ZMWU: Mann-Whitney Test and T: Student T Test, BMI : body mass index, DM : diabetes mellitus, EF : ejection fraction, STEMI : ST segment elevation myocardial infarction.

Table 5. In-hospital outcome among ACS group according to H. pylori.

In-hospital outcome	**ACS group with positive H. Pylori (No. = 48)**		**ACS group with negative H. Pylori (No. = 52)**		**Test value**	**P-value**
	No.	**%**	**No.**	**%**		
Cardiac arrest	4	8.3%	1	1.9%	X^2= 1.021	0.192^{FET} (NS)
Cardiogenic shock	9	18.8%	4	7.7%	X^2= 1.809	0.179 (NS)
Reinfarction	5	10.4%	1	1.9%	X^2= 1.864	0.102^{FET} (NS)
CVS	3	6.3%	0	0.0%	X^2=1.547	0.107^{FET} (NS)

NS: Non significant, HS: High statistically significant, X^2: Chi- Square test, FET: Fischer Exact Test, CVS : cerebrovascular stroke

Discussion

This study was conducted on a sample of 100 patients who were diagnosed with acute coronary syndrome and 50 healthy individuals. The main objective of this study was to investigate the link between H. pylori and patients with acute coronary syndrome, as well as its impact on short-term outcomes.

The average age of the patients with ACS was 60.60±10.28 years, with 68% of them being male and an average BMI of 26.13±4.95 Kg/m2. In contrast, the control group had an average age of 50.05±15.97 years, with 62% being male and an average BMI of 24.07±4.69 Kg/m2. Both age and BMI were significantly higher in the patients with ACS compared to the control group ($p<0.001$ and $p=0.002$, respectively). However, there were no significant differences between the two groups in terms of gender ($p>0.05$).

The outcomes we obtained align with the discoveries made by **Hung et al. (2006)**, who sought to investigate the correlation between coronary vasospasm, inflammatory markers, and the development of inflammatory coronary artery disease and early atherosclerosis. They observed no noteworthy variations in age across the groups under examination. Additionally, **Tamer et al. (2009)** discovered no significant variances in BMI between patients with coronary atherosclerosis, acute coronary syndromes, and the control group.

Regarding medical history, our findings revealed statistically significant

disparities between patients with ACS and the control group in terms of hypertension, diabetes mellitus, and smoking ($p<0.05$). These results are also corroborated by **Hung et al. (2006)**, who established significant differences between the groups being studied concerning smoking and diabetes mellitus. However, they did not find any significant differences in relation to hypertension. Conversely, **Tamer et al. (2009)** found no significant disparities between the groups being examined with regard to hypertension, diabetes mellitus, and smoking.

Echocardiography findings demonstrated that nearly all cases within the ACS group displayed hypokinesia. The average ejection fraction in the ACS group was 46.21±7.38%. There were statistically significant variances in echocardiography findings between patients with ACS and the control group ($p<0.001$).

In terms of detecting H. pylori in stool samples, our findings indicated a positive presence in 48% of cases within the ACS group and 60% of cases within the control group. However, there were no noteworthy distinctions between the two groups with regards to the presence of H. pylori in stool ($p>0.05$). These results align with those of **Tamer et al. (2009)**, who also observed no considerable differences between the groups under study in relation to H. pylori in stool.

Numerous research studies have documented a connection between H. pylori infection and ACS. In an effort to shed light on the risk factors for acute coronary syndrome, **Miyazaki et al. (2006)** discovered a correlation between ACS and HP infection. Similarly, **Fang et al. (2019)** demonstrated that the onset of ACS was linked to H. pylori infection and the accompanying inflammation.

In a nationwide retrospective cohort study conducted by **Lai et al. (2015)**, the aim was to determine the risk of ACS associated with H. pylori infection. Their findings revealed that the presence of comorbidities such as hyperlipidemia and COPD increased the risk of developing ACS in patients with H. pylori infection. Additionally, **Eskandarian et al. (2012)** conducted a study that found a significant association between H. pylori seropositivity and short-term adverse outcomes in patients with ACS.

Ossei-Gerning et al. (1997) reached the conclusion that being infected with H. pylori is connected to the presence of coronary atheroma. **Tong et al. (2022)**, on the other hand, conducted an extensive evaluation and meta-analysis to examine the connection between H.pylori infection and the risk of coronary heart disease. The outcomes of their research provided substantial evidence supporting a link between H. pylori infection and the risk of developing coronary heart disease.

Furthermore, numerous studies have proposed that H. pylori might contribute to the advancement of atherosclerosis through the stimulation of chronic low-grade inflammation **(Ossei-Gerning et al., 1997; Pasceri et al., 1998)**.

Our results may be explained by small size of sample and the endemic nature of H.pylori infection in our country.

This study has certain limitations, including a small sample size and a specific population from which the participants were recruited. These limitations may potentially restrict the generalizability of the findings. Additionally, self-reported medical

history information may be subject to bias, and the use of stool samples for Helicobacter pylori detection may have limitations in accuracy.

Conclusion

Helicobacter pylori infection was not significantly different between ACS patients and control group. H. pylori infection was not associated with any of the clinical or laboratory parameters in ACS patients. Moreover, H. pylori infection did not affect the outcomes of ACS patients, such as cardiac arrest, cardiogenic shock, reinfarction, and CVS.

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