Original Article

The Relationship between *Helicobacter pylori* Infection and Dyslipidemia in Hypertension: Case-Control Model

Ali Razzaq Hussein, Enas Jalil Baqer Almayali[1]

Directorate of Education in AL-Najaf, Ministry of Education, AL-Najaf, Iraq, [1]Faculty of Medicine, Jabir ibn Hayyan University for Medical and Pharmaceutical Sciences, AL-Najaf, Iraq

Abstract

Background: Hypertension and/or *Helicobacter pylori* infections have an increasing prevalence in populations. *H. pylori* normally colonizes the stomach due to its ability to resist high acidity. Under abnormal conditions, it can cause infection through various virulence factors. **Objective:** The current study aims to determine the relationship between *H. pylori* IgG prevalence and lipid profile in hypertension using a case-control model. **Materials and Methods:** A total of 68 cases (34 hypertension and 34 healthy) were attended to at Al-Hakeem General Hospital in AL-Najaf Province, Iraq, during the period from July 2022 to September 2022, with an age range of 35–65 years. The blood specimens were aspirated and tested for *H. pylori* IgG using a rapid test (Lungene, China) and for lipid profiles using RX Daytona Analyzer (Randox, United Kingdom), following the instructions of manufacturing companies. **Results:**The mean age was significantly higher in hypertension than in control (P = 0.033), with the predominant age group in hypertension patients being 56–65 years. This study revealed that *H. pylori* was insignificantly higher in hypertension than in control group (P = 0.089). The lipid profile (cholesterol, triglycerides, and low-density lipoprotein) in hypertension patients was significantly P = 0.000, P = 0.000, and P = 0.000) higher in both the presence and absence of anti-*H. pylori* IgG (P = 0.000) than in control group, respectively. However, high-density lipoprotein level was insignificantly different between patients and controls in both presence (P = 0.394) and absence (P = 0.133) of anti-*H. pylori* IgG. **Conclusion:** Lipid profile abnormalities are related to hypertension, without difference in the presence and absence of anti-*H. pylori* IgG by case-control model.

Keywords: Dyslipidemia, *Helicobacter pylori*, hypertension, Iraq, lipid profile

Introduction

Helicobacter pylori is a gram-negative, motile, microaerophilic bacterium that colonizes the stomach as a part of normal flora. However, it can lead to a wide range of disorders, including autoimmune diseases (inflammatory bowel disease, autoimmune metabolic diseases, autoimmune liver diseases, rheumatic diseases, and autoimmune dermatosis),[1] gastrointestinal diseases (dyspepsia, gastritis, peptic ulcer disease, gastric cancer, and mucosa-associated lymphoid tissue lymphoma), and extra-gastric manifestations (iron deficiency anemia and idiopathic thrombocytopenic purpura).[2] Moreover, it plays a role in other *H. pylori* extra-gastric disorders, including typhoid fever,[3] dyslipidemia disease,[4] and hypertension.[5]

This wide range of different diseases may be due to the large number of virulence factor; *H. pylori* has 22 reported virulence factors such as urease, flagellum, catalase, heat shock proteins, and lipopolysaccharide.[6] "Dyslipidemia is defined as the imbalance of lipids such as cholesterol, low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), and high-density lipoprotein (HDL), resulting from primary (genetic) or secondary (environmental) factors".[7] It is classified according to clinical practice, phenotype, and pathogenesis.[8]

Access this article online

Quick Response Code:

Website: https://journals.lww.com/mjby

DOI: 10.4103/MJBL.MJBL_1187_23

Address for correspondence: Dr. Ali Razzaq Hussein, Directorate of Education in AL-Najaf, Ministry of Education, AL-Najaf, Iraq. E-mail: enas.j.baqir@jmu.edu.iq

Submission: 14-Aug-2023 **Accepted:** 21-Jan-2024 **Published:** 23-Jan-2026

How to cite this article: Hussein AR, Almayali EJB. The relationship between *Helicobacter pylori* infection and dyslipidemia in hypertension: Case-control model. Med J Babylon 2025;22:1334-8.

A meta-analysis has shown that *H. pylori* infection is positively related to LDL-C, total cholesterol, and TG and negatively to HDL-C.[9] Moreover, Yue *et al*.'s study[5] suggested that *H. pylori* infection increases the risk of hypertension. This evidence implies that *H. pylori* infection may be correlated with dyslipidemia and hypertension.[10]

However, most published studies are performed in the form of a cross-sectional model. Moreover, in Iraq, there is no available case-control report on the role of *H. pylori* seropositivity and lipid profile in hypertension. Therefore, this study aims to evaluate the relationship between *H. pylori* IgG seropositivity (for increased sensitivity) and lipid profile in hypertensive Iraqi individuals.

Materials and Methods

Collection of specimens

A total of 68 cases (34 hypertension and 34 healthy) were attended to at Al-Hakeem General Hospital in AL-Najaf Province, Iraq, during the period from July 1, 2022 to September 30, 2022, with an age range of 35–65 years. Patients with signs and symptoms of hypertension were selected only if they had high blood pressure readings; those with normal blood pressure were excluded. They were then directed for lipid profile and *H. pylori* IgG assessment. Control individuals with normal blood pressure and without any clinical signs and symptoms of hypertension were selected, and those found to have high blood pressure were excluded. Furthermore, any subjects (patients and controls) who were supposed to have any other disorder were excluded from this study. The blood specimens from both the patient and control groups were collected, centrifuged, and transferred into two tubes as follows:

A. One tube was used for the detection of *H. pylori* by a rapid test.
B. Another tube was frozen at −20°C in a deep freeze for the determination of lipid profile levels at a later time.

H. pylori diagnosis

H. pylori was serologically diagnosed by a rapid test, which includes immobilized anti-human IgG and was performed according to the instructions of the manufacturing company (Lungene, China). If the specimen contains *H. pylori* antibodies, a colored band will appear in the test line region, indicating a positive result..

Lipid profile

The lipid profile was studied using the RX Daytona Analyzer following the instructions provided by the manufacturing company (Randox, United Kingdom).

Statistical analysis

Statistical analysis was carried out using IBM SPSS Statistics 26 software. The statistical differences in qualitative parameters among different groups were detected using the Chi-square test. For quantitative data, mean ± SE were calculated, and differences were tested using *t* test for two means. Statistical significance was measured based on probability of $P < 0.05$.

Ethical approval

The study was performed in agreement with the ethical basics that have their origin in the Declaration of Helsinki. It was carried out with the verbal and analytical authorization of the patients before samples were taken. The study protocol, subject information, and consent form were evaluated and approved by a local ethics committee under document number 50,843 (issued in December 2021) to get this approval.

Results

Hypertension and sex

The current study exhibited that out of 34 hypertension patients, 19 (55.9%) were females and 15 (44.1%) were males. For the 34 apparently healthy controls, 18 (52.9%) were females and 16 (47.1%) were males. The proportion of females in hypertension was insignificantly higher than that of males ($P = 0.808$), as shown in Table 1.

Hypertension and age

The age range of hypertension patients in the present study is 35–65 years, with a mean of 51.65 ± 1.4 years. For the control group, the age range is 35–64 years, with a mean of 47.02 ± 1.6 years. The mean age was significantly higher in hypertension than in control group ($P = 0.033$).

The subjects in this study were divided into three age sets (35–35, 46–55, and 56–65). The predominant age group in hypertension patients is 56–65, followed by 46–55, and then 35–45, whereas in control group, it is 35–45, followed

Table 1: Distribution of hypertension patient rendering to sex

Sex	Patient		Control		Total		*P* value
	No.	%	No.	%	No.	%	
Female	19	55.9	18	52.9	37	54.4	0.808
Male	15	44.1	16	47.1	31	45.6	
Total	34	100	34	100	68	100	

by 46–55, and then 56–65 [Table 2]. However, there are no significant differences ($P = 0.80$).

Hypertension and *H. pylori*

This study depended on a rapid test in qualitative (positive/negative) detection of *H. pylori* IgG in serum. This study revealed that 58.8% (20/34) of hypertension patients were *H. pylori* positive, and 41.2% (14/34) were *H. pylori* negative in serum. In the control group, 38.2% (13/34) were *H. pylori* positive, and 61.8% (21/34) were *H. pylori* negative. *H. pylori* is insignificantly higher in hypertension ($P = 0.089$) [Table 3].

Lipid profile in hypertension and control

Cholesterol level is significantly ($P = 0.000$) higher in hypertension (269.06 ± 7.7) than in control group (145.06 ± 4.4). Additionally, the TG level is significantly ($P = 0.000$) higher in hypertension (246.06 ± 14.2) than in control group (100.6 ± 2.9). However, HDL level is insignificantly ($P = 0.186$) lower in hypertension (38.8 ± 1.4) than in control group (41.2 ± 1.03). In respect of HDL, LDL level is significantly ($P = 0.000$) higher in hypertension (119.8 ± 4.3) than in control group (80.71 ± 1.4) [Table 4].

Lipid profile according to *H. pylori*

H. pylori-infected patients' serum showed a cholesterol level significantly ($P = 0.000$) higher in hypertension (262.7 ± 7.95) than in control group (145.8 ± 7.3). The TG level was also significantly ($P = 0.000$) higher in hypertension (247 ± 17.99) than in control group (2.706 ± 0.440). However, the HDL level was insignificantly ($P = 0.394$) lower in hypertension (39.1 ± 2) than in control group (40.2 ± 1.96). The LDL level was significantly ($P = 0.000$) higher in hypertension (114.5 ± 5.5) than in control group (77.9 ± 195).

H. pylori non-infected patients' serum showed a cholesterol level significantly ($P = 0.000$) higher in hypertension (278.2 ± 14.8) than in control group (144.6 ± 5.7). The TG level was significantly ($P = 0.000$) higher in hypertension (246.5 ± 23.7) than in control group (104 ± 4.07). However, HDL level was insignificantly ($P = 0.133$) lower in hypertension (38.36 ± 1.8) than in control group (41.7 ± 1.2). The LDL level was significantly ($P = 0.000$) higher in hypertension (127.4 ± 6.8) than in control group (82.4 ± 1.8) [Table 5].

Discussion

This study reports an insignificant relationship between the development of hypertension and gender. Alternatively, females appear to be more susceptible to hypertension than males. There is an insignificantly higher level of *H. pylori* IgG in patients, but a significantly higher lipid profile is observed in hypertension. The lipid profile is significantly higher in both subjects, irrespective of the presence or absence of anti-*H. pylori* IgG. The more valuable insight from the current study is the

Table 2: Distribution of hypertension patients according to age groups

Age	Patient		Control		Total		*P* value
	No.	%	No.	%	No.	%	
35–45	8	23.5	16	47.1	24	35.3	0.80
46–55	12	35.3	11	32.3	23	33.8	
56–65	14	41.2	7	20.6	21	30.9	
Total	34	100	34	100	68	100	

Table 3: Distribution of *H. pylori* seropositivity in hypertension and control

H. pylori infection	Patient		Control		Total		*P* value
	No.	%	No.	%	No.	%	
H. pylori +ve	20	58.8	13	38.2	33	48.5	0.089
H. pylori −ve	14	41.2	21	61.8	35	51.5	
Total	34	100	34	100	68	100	

Table 4: Lipid profile in hypertension and control

Lipid profile	Cholesterol	TG	HDL	LDL
Patient	269.06 ± 7.7	246.06 ± 14.2	38.8 ± 1.4	119.8 ± 4.3
Control	145.06 ± 4.4	100.6 ± 2.9	41.2 ± 1.03	80.71 ± 1.4
P value	0.000	0.000	0.186	0.000

TG: triglycerides, HDL: high-density lipoprotein, LDL: low-density lipoprotein

Table 5: Lipid profile according to *H. pylori*

Lipid profile		Cholesterol	TG	HDL	LDL
H. pylori +ve	Patient	262.7 ± 7.95	247 ± 17.99	39.1 ± 2	114.5 ± 5.5
	Control	145.8 ± 7.3	93.9 ± 3.2	40.2 ± 1.96	77.9 ± 195
	P value	0.000	0.000	0.69	0.000
H. pylori −0ve	Patient	278.2 ± 14.8	246.5 ± 23.7	38.36 ± 1.8	127.4 ± 6.8
	Control	144.6 ± 5.7	104.8 ± 4.07	41.7 ± 1.2	82.4 ± 1.8
	P value	0.000	0.000	0.133	0.000

TG: triglycerides, HDL: high-density lipoprotein, LDL: low-density lipoprotein

absence of any role of *H. pylori* in elevated lipid profiles in hypertonic cases.

The study by Xiong *et al*.[11] revealed a significant susceptibility of females to hypertension. Moreover, Blood *et al.*,[12] in the USA, found that 56% of 10,803 hypertension patients were female. The current study reports the mean age of patients as 51.65 years old, while a meta-analysis[13] revealed that the mean age across different populations is between 42.58 and 68.05 years old. Another study[11] also reports significantly older hypertensive subjects than control subjects.

The current case-control study revealed insignificantly higher *H. pylori* IgG in hypertension subjects than in control group, as reported by Fang *et al.*[13] Their study indicated that *H. pylori*-infected individuals had a 13.4% higher risk for hypertension than uninfected individuals. The previous non-case-control study reports a significant relationship between *H. pylori* and hypertension. This is evident in a meta-analysis by Huang *et al*.,[14] as well as in cross-sectional studies conducted by Xiong *et al*.[11] and Soomro *et al*.[15]

Kountouras *et al*.[16] proposed several pathogenic mechanisms of hypertension induced by *H. pylori*, including metabolic and liver disorders such as augmented oxidative stress, risen insulin resistance, gastrointestinal dysbiosis, raised vasoconstriction, and decreased vasodilation, alongside genetic and epigenetic alterations. *H. pylori* can affect a variety of biomarkers such as the lipid profile, Th1/Th2 balance, activation of platelet, and autoimmunity, which are essential for cardiovascular disease.[17] In other words, there is a relationship between the intake of salt, which is a critical agent of hypertension, and *H. pylori* infection.[18]

The variations in results compared to other studies may be attributed to differences in study design, sample size, differences in diagnosis tests, or the possibility of false positives. It is worth considering that hypertension patients, who are typically older, may have undergone chemotherapy with potential side effects on the stomach, rendering them more susceptible to *H. pylori* infection.[19]

The current case-control study shows higher lipid profile results in both cases with the presence and absence of anti-*H. pylori* IgG between hypertension and control, as follows: cholesterol, TG, and HDL were significantly higher in hypertension, and HDL level was insignificantly higher in control group. There is a study[20] that shows *H. pylori* infection is linked with an high risk of dyslipidemia in the Cameroon community. This study also indicates that *H. pylori* infection is an independent risk factor for coronary heart disease and reveals that the pathogen might directly invade the cardiovascular wall. There is evidence indicating that *H. pylori* can lead to altered lipid profiles.[21] Hashim *et al*.[22] registered that more than two-thirds of the *H. pylori* seropositive sets revealed dyslipidemia in at least one lipid profile.

Most research on the relationship between *H. pylori* and dyslipidemia has been conducted on random samples using a cross-sectional method. In contrast, the current case-control study focused on the hypertension population. Thus, there is a consensus that the evidence supporting the role of *H. pylori* in the development of coronary artery disease is misleading, and no definite signs of benefit have been shown in eliminating the organism or preventing cardiovascular consequences.[23]

The current study recommended performing more studies to confirm if there is a role of *H. pylori* in hypertension and dyslipidemia.

Conclusions

This study concludes that *H. pylori* is insignificantly higher in hypertension than in control. Additionally, the lipid profile (cholesterol, TG, and LDL) is significantly higher in both cases, regardless of the presence and absence of anti-*H. pylori* IgG, in hypertension patients.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Wang L, Cao ZM, Zhang LL, Dai XC, Liu ZJ, Zeng YX, *et al*. *Helicobacter pylori* and autoimmune diseases: Involving multiple systems. Front Immunol 2022;13:833424.

2. Aumpan N, Mahachai V, Vilaichone RK. Management of *Helicobacter pylori* infection. JGH Open 2022;7:3-15.
3. Hussein AR, Aldujaili NH. Seropositivity of *H. pylori* and typhoid fever in dyspepsia Iraqi patients. Prensa Med Argent 2021;107:291.
4. Nigatie M, Melak T, Asmelash D, Worede A. Dyslipidemia and its associated factors among *Helicobacter pylori*—Infected patients attending at University of Gondar Comprehensive Specialized Hospital, Gondar, North-West Ethiopia: A comparative cross-sectional study. J Multidiscip Healthc 2022;15:1481-91.
5. Yue L, Zhang R, Chen S, Duan G. Relationship between *Helicobacter pylori* and incident hypertension as well as blood pressure: A systematic review and meta-analysis. Dig Dis 2022;41:124-37.
6. Baj J, Forma A, Sitarz M, Portincasa P, Garruti G, Krasowska D, *et al*. Helicobacter pylori virulence factors—Mechanisms of bacterial pathogenicity in the gastric microenvironment. Cells 2020;10:27.
7. Pappan N, Rehman A. Dyslipidemia [Updated Jul 11, 2022]. In: StatPearls [Internet]. Treasure Island, FL: StatPearls Publishing; 2022.
8. Mosca S, Araújo G, Costa V, Correia J, Bandeira A, Martins E, *et al*. Dyslipidemia diagnosis and treatment: Risk stratification in children and adolescents. J Nutr Metab 2022;2022:4782344.
9. Shimamoto T, Yamamichi N, Gondo K, Takahashi Y, Takeuchi C, Wada R, *et al*. The association of *Helicobacter pylori* infection with serum lipid profiles: An evaluation based on a combination of meta-analysis and a propensity score-based observational approach. PLoS One 2020;15:e0234433.
10. Furuto Y, Kawamura M, Yamashita J, Yoshikawa T, Namikawa A, Isshiki R, *et al*. Relationship between *Helicobacter pylori* infection and arteriosclerosis. Int J Gen Med 2021;14:1533.
11. Xiong X, Chen J, He M, Wu T, Yang H. *Helicobacter pylori* infection and the prevalence of hypertension in Chinese adults: The Dongfeng-Tongji cohort. J Clin Hypertens (Greenwich) 2020;22:1389-95.
12. Blood AJ, Cannon CP, Gordon WJ, Mailly C, MacLean T, Subramaniam S, *et al*. Results of a remotely delivered hypertension and lipid program in more than 10 000 patients across a diverse health care network. JAMA Cardiol 2023;8:12-21.
13. Fang Y, Xie H, Fan C. Association of hypertension with *Helicobacter pylori*: A systematic review and meta analysis. PLoS One 2022;17:e0268686.
14. Huang M, Zhu L, Jin Y, Fang Z, Chen Y, Yao Y. Association between *Helicobacter pylori* infection and systemic arterial hypertension: A meta-analysis. Arq Bras Cardiol 2021;117:626-36.
15. Soomro NI, Iqbal S, Iqbal J, Imran M, Bakhtiar SM. The potential impact of *Helicobacter pylori* infection on the onset of metabolic disease. Health Sci J 2020;14:1-8.
16. Kountouras J, Papaefthymiou A, Polyzos SA, Deretzi G, Vardaka E, Soteriades ES, *et al*. Impact of *Helicobacter pylori*-related metabolic syndrome parameters on arterial hypertension. Microorganisms 2021;9:2351.
17. Testerman TL. Chapter 8—*Helicobacter pylori*, Vascular Responses to Pathogens. Academic Press; 2016. p. 87-109.
18. Wu H-h, Wang C, Wang G-j, Zhao Q-h, Li L, Chen W-j, *et al*. Relationship between the intake of salt and salted food and the infection of *Helicobacter pylori* in 40-69 years old local residents in a county with high gastric cancer risk in Anhui Province/中华疾病控制杂志. Chin J Dis Control Prev 2020;24:164-9.
19. Borghi C, Fogacci F, Agnoletti D, Cicero AF. Hypertension and dyslipidemia combined therapeutic approaches. High Blood Press Cardiovasc Prev 2022;29:221-30.
20. Tali LDN, Faujo GFN, Konang JLN, Dzoyem JP, Kouitcheu LBM. Relationship between active *Helicobacter pylori* infection and risk factors of cardiovascular diseases, a cross-sectional hospital-based study in a Sub-Saharan setting. BMC Infect Dis 2022;22:731.
21. Abdu A, Cheneke W, Adem M, Belete R, Getachew A. Dyslipidemia and associated factors among patients suspected to have *Helicobacter pylori* infection at Jimma University Medical Center, Jimma, Ethiopia. Int J Gen Med 2020;13:311-21.
22. Hashim M, Mohammed O, Wolde M. The association of *Helicobacter pylori* infection with dyslipidaemia and other atherogenic factors in dyspeptic patients at St. Paul's Hospital Millennium Medical College. Heliyon 2022;8:e09430.
23. Sharma V, Aggarwal A. *Helicobacter pylori*: Does it add to risk of coronary artery disease. World J Cardiol 2015;7:19-25.