Aswan University Medical Journal, volume 5 / No.3/ September 2025 (103-111) Online ISSN: **2735-3117**

ORIGINAL ARTICLE

Association between Helicobacter Pylori Infection and Nonalcoholic Fatty Liver Disease in School-Aged Children in Aswan

Magda F Gabri[1], Hanan M. Abd-El Moneim[1], Mostafa O Mohammad[1*], Ahmed M Ali[2], Mohammed Z Abu Rahma[3], Sherin A. Taha [4]

[1] Pediatrics Department, Faculty of Medicine, Aswan University.

[2]Pediatrics Department, Faculty of Medicine, Assiut University

[3] Department of gastroenterology and Tropical Medicine, Faculty of Medicine, Assiut University

[4] Pediatrics Department, Faculty of Medicine, Suez University

ABSTRACT

Keyword: Diabetes mellitus, acute kidney injury, Diabetic Ketoacidosis

Corresponding author :

Mostafa Omar Mohammad

Mobile: 01069280855E-

mail: mostafaomar040@gmail.com

Background Information: Nonalcoholic fatty liver disease (NAFLD) is one of the gastrointestinal and metabolic conditions linked to Helicobacter pylori infection. NAFLD has emerged as one of the most prevalent hepatic disorders in pediatric populations as a result of the growth in childhood obesity. **The objective** is to assess how an H. pylori infection affects liver health, particularly how it can contribute to the development of nonalcoholic fatty liver disease. **Methodology**: Ninety-five school-aged children who presented with dyspepsia at Aswan University Hospital participated in a cross-sectional study. Stool antigen testing was used to diagnose an H. pylori infection. Liver function tests and abdominal ultrasonography were used to evaluate liver health. **Results**: Of the 95 kids, 48 (50.5%) tested positive for H. pylori. According to ultrasound results, 5.3% of patients had hepatomegaly and elevated liver echogenicity, which could indicate fatty liver abnormalities. Children with H. pylori infection had significantly higher mean ages (9.07 ± 2.40 vs. 7.88 ± 2.62 years, p=0.023), hepatomegaly rates (10.4% vs. 0%, p=0.023), and epigastric pain rates (89.6% vs. 29.8%, p<0.001) than children without H. pylori infection. Gender, residence, hematemesis, vomiting, and stomach discomfort did not significantly differ from one another (p>0.05). **Conclusion**: Hepatomegaly and epigastric pain are substantially linked to H. pylori infection in children. These results underline the need for more research in this field and point to a possible involvement of H. pylori in the development of NAFLD.

INTRODUCTION

Helicobacter pylori (H. pylori) is a Gram-negative rod bacterium. associated with peptic ulcer disease, gastric cancer, and many gastrointestinal disorders. (1) It is among the most prevalent bacterial illnesses globally, affecting more than fifty percent of the population. (2) Recent data indicates a correlation between metabolic disorders, including nonalcoholic fatty liver disease (NAFLD), and H. pylori infection (3).

NAFLD is increasingly prevalent among youngsters, primarily attributed to escalating obesity rates. The incidence in Egypt was 15.7% (4). The "multiple hit" hypothesis posits that changes in gut microbiota, insulin resistance, and deregulation of hepatic lipid metabolism may facilitate the onset of NAFLD (5). H. pylori infection is recognized as a modulator of gut microbiota composition, potentially influencing the development of NAFLD. (2) Although this link has been well examined in adults, limited research exists concerning its effects on children. There is more data supporting a link between NAFLD and H. pylori (6).

This study sought to evaluate the correlation between pediatric patients' NAFLD and H. pylori infection.

PATIENTS AND METHODS

A study that is cross-sectional performed at Aswan University Hospital.
Individuals involved: The study comprised ninety-five school-aged children (4-14 years) exhibiting dyspepsia. Children with pre-existing chronic liver disease, obesity, metabolic syndrome, or diabetes mellitus were omitted.
Data Collection: Each participant received a comprehensive medical history, physical examination, stool antigen assay for H. pylori identification, liver function tests (AST, ALT, total bilirubin, total protein, serum albumin), fasting plasma glucose measurement, lipid profile analysis, and abdominal ultrasound evaluation.

The Mindray Diagnostic Ultrasound System, manufactured by Shenzhen Mindray Bio-Medical Electronics in China, used a 4.5 MHz convex probe to conduct an abdominal ultrasound examination on all subjects by a Gastroenterology and Liver Consultant with extensive experience (7). Each child's stool was collected at a rate of approximately 1 g and subsequently diluted in a 5 ml samples diluent. Eagle Biosciences, Inc., Amherst, NH, USA, provided the reagent for the Enzyme Immunoassay Test (ELISA) to investigate the H. pylori antigen in this test (8). No acid-suppressive medicines or antibiotics were ingested in the four weeks preceding the test.
Statistical Analysis: The gathered data were analyzed using IBM SPSS Statistics software (version 26). Continuous variables were presented as mean ± SD and analyzed using independent t-tests or Mann-Whitney tests where applicable. Chi-square tests have been utilized to analyze categorical variables. A p-value of less than 0.05 was used to establish statistical significance.

Ethical consent:

The Institutional Ethics Committee authorized the study protocol and Research Review Board of Aswan University's Faculty of Medicine. Prior to their children's enrollment in the experiment, each parent of a participating child furnished signed informed consent.

RESULTS

Table 1 presents the demographics of our cases: The average age of participating children was 8.48 ± 2.57 years, comprising 45.3% males and 54.7% from rural areas.

Table (1): Patients' demographic characteristics (n=95)

Variables	Frequency (Percentage %)
Gender	
Male	43 (45.3%)
Female	52 (54.7%)
Age (years)	
Mean ± SD.	8.484 ± 2.5697
Range	4-14
Age categories	
4-9.50	65 (68.4%)
10-14	30 (31.6%)
Residence	
Urban	43 (45.3%)
Rural	52 (54.7%)
Weight (kg)	
Mean ± SD.	23.879 ± 7.8898
Range	23 (14.50-54)
Height (cm)	
Mean ± SD.	119.237 ± 15.3377
Range	119 (92-160)
Body mass index (Kg/m^2)	
Mean ± SD.	16.3492 ± 1.7937
Range	16.1 (12.30-21.50)

Figure (1) Displays the clinical parameters of the examined patients, with epigastric soreness being the most prevalent, succeeded by vomiting and stomach pain. Five children exhibited hepatomegaly, whereas just one child presented with hematemesis. 50.5% (48) of the evaluated youngsters tested positive for H. pylori.

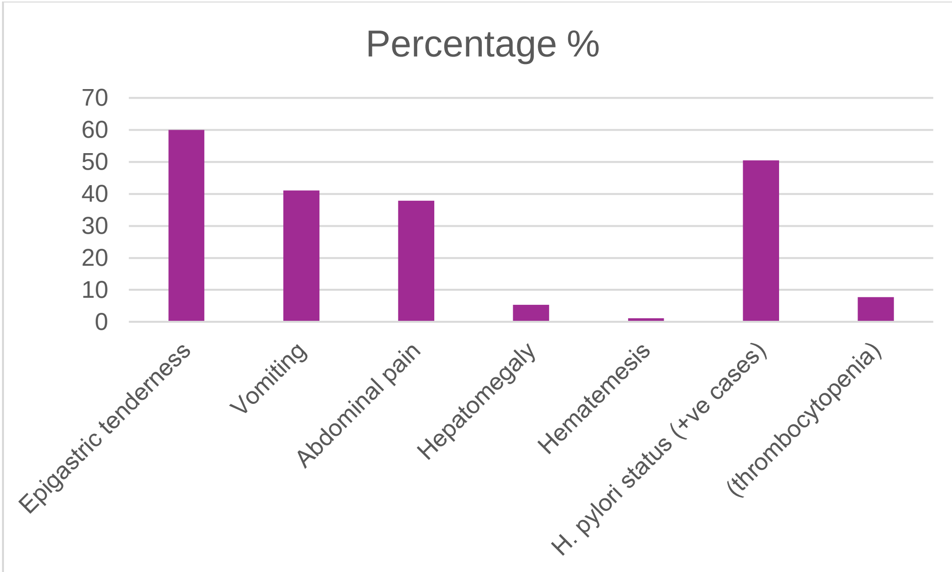

Figure (1) shows the clinical parameters of the studied cases.

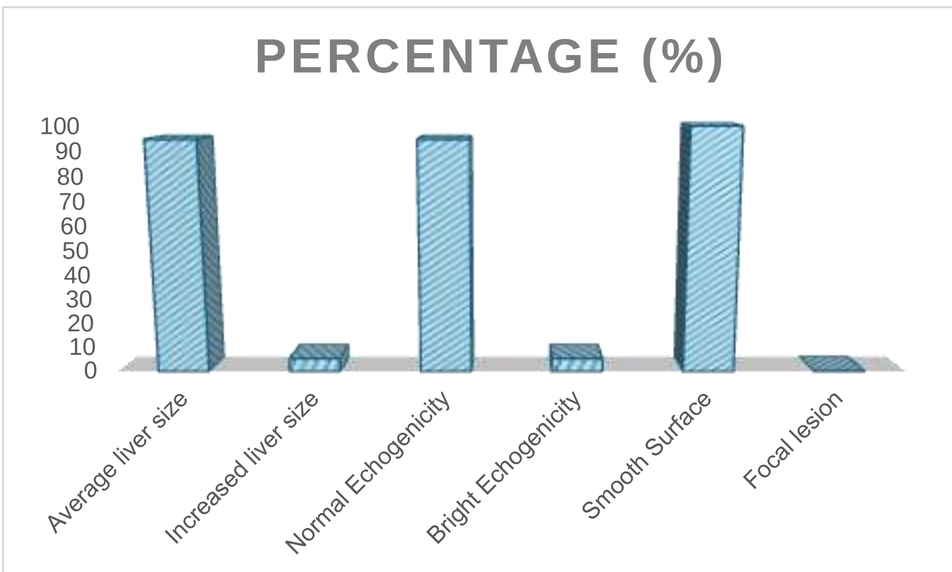

Figure (2): Abdominal ultrasound of study children

Figure 2 shows that 5.3% of cases had increased liver size and bright echogenicity, while all children had smooth liver surfaces.

Table (2): Pattern of liver function test and Liver US in H. Pylori positive and negative cases

Parameters	H. Pylori status		P value
	Positive (n=48)	Negative (n=47)	
	Mean ± SD	**Mean ± SD**	
AST (U/L)	24.50 ± 4.654	23.30 ± 5.369	0.246#
ALT (U/L)	24.31 ± 4.921	23.64 ± 4.678	0.496#

Total bilirubin (mg/dL)		0.682 ± 0.1627	0.6128 ± 0.1813	0.052#
Total protein (gm)		7.002 ± 0.4349	6.968 ± 0.3648	0.681#
Serum albumin (gm)		4.05 ± 0.3345	3.983 ± 0.6001	0.502#
		Number (%)	**Number (%)**	
Serum Albumin level	Low (<3.5 gm)	1 (2.08%)	3 (6.38%)	0.235
	Normal (3.5-5.3 gm)	47 (97.92%)	43 (91.48%)	
	High (>5.3 gm)	0 (0%)	1 (2.13%)	
Liver size (US)	Average	43 (89.6%)	47 (100%)	**0.023***
	Increased	5 (10.4%)	0 (0%)	
Echogenicity	Normal	43 (89.6%)	47 (100%)	0.023*
	Bright	5 (10.4%)	0 (0%)	

*Significant chi-square test; Student t-test; AST: Aspartate transferase; ALT: Alanine aminotransferase.

Table 2 shows that epigastric tenderness was significantly more common in H. pylori-positive children (89.6% vs. 29.8%, p<0.001). Hepatomegaly was also significantly higher in the H. pylori-positive group (10.4% vs. 0%, p=0.023). No statistically significant difference exists between H. pylori infection and liver function tests, p-value >0.05.

Table (3): Lipid profile in H. pylori infection (comparison between positive and negative cases)

Parameters		**H. Pylori status**		**P value**
		Positive (n=48) N (%)	Negative (n=47) N (%)	
Total cholesterol (mg/dL)	Normal (<170)	44 (91.7%)	47 (100%)	**0.043***
	Elevated (≥170)	4 (8.3%)	0 (0%)	
	Mean ± SD	123.47 ± 33.98	74.51 ± 10.9899	**<0.001****
Serum triglycerides (mg/dL)	Normal (<90)	37 (77.1%)	46 (97.87%)	**0.002***
	Elevated (>90)	11 (22.9%)	1 (2.13%)	
	Mean ± SD	81.92 ± 33.114	62.298 ± 11.497	**<0.001****
HDL-C (mg/dL)	Normal (>45)	29 (60.4%)	36 (76.6%)	0.090
	Elevated (<45)	19 (39.6%)	11 (23.4%)	
	Mean ± SD	48.446 ± 8.213	50.489 ± 7.0707	0.197
LDL-C (mg/dL)	Normal (<110)	45 (93.8%)	47 (100%)	0.082
	Elevated (>110)	3 (6.3%)	0 (0%)	
	Mean ± SD	70.267 ± 18.72	66.085 ± 10.034	0.178
HBA1c	**Mean ± SD**	4.988 ± 0.2647	5.015 ± 0.3252	0.651

*Significant chi-square test; **Significant student t-test; HDL-C: High-density lipoprotein; LDL-C: Low-density lipoprotein; HBA1c: Glycosylated hemoglobin.

Regarding lipid profile, H. pylori-positive cases exhibited significantly higher total cholesterol levels (8.3% vs. 0%, p=0.043) and triglycerides (22.9% vs. 2.13%, p=0.002), suggesting a potential metabolic impact of H. pylori infection.

Table (4): Relation between H. pylori status, demographic, and clinical features

Parameters		**H. Pylori status**		**P value**
		Positive (n=48)	Negative (n=47)	
		N (%)	N (%)	
Gender	Male	21 (43.8%)	22 (46.8%)	0.765
	Female	27 (56.3%)	25 (53.2%)	
Residence	Urban	21 (43.8%)	22 (46.8%)	0.765
	Rural	27 (56.3%)	25 (53.2%)	
Hepatomegaly		5 (10.4%)	0 (0%)	**0.023***
Hematemesis		1 (2.1%)	0 (0%)	0.320
Vomiting		21 (43.8%)	18 (38.3%)	0.589
Abdominal pain		19 (39.6%)	17 (36.2%)	0.732
Epigastric tenderness		43 (89.6%)	14 (29.8%)	**<0.001***
Age (years)		**Mean ± SD**	**Mean ± SD**	
		9.073 ± 2.399	7.883 ± 2.6235	**0.023****

*Significant Chi-square test, **Significant student t-test

Significant differences were observed in liver size (hepatomegaly), epigastric tenderness and age between the H. pylori-positive and negative categories (p>0.05) in Table 4.

DISCUSSION

Infection with H. Pylori was identified in 50.5% of our patients via stool antigen testing. Similar findings have been documented in Türkiye (49%) by Çınar et al. (9). In Egypt, Al-Mendalawi (10) did a study on healthy schoolchildren as Serum IgG levels against H.pylori were assessed in the governorate of Al Qulubia., which revealed a Frequency of 44%. Our finding surpassed the 15.1% observed in Taiwan (11) and the 27.4% recorded in Saudi Arabia (12). Research findings, along with information from other sources, indicate a significant variation in the prevalence of H. pylori infections globally. Tsongo et al. (13) indicated that the discrepancies in findings are likely attributable to variations in the study population, encompassing urban inhabitants, age, and health status of the subjects. Research conducted by Biernat et al. (14) and Ozbey et al. (15) has demonstrated that lower socioeconomic position, sanitary conditions, educational background, and the proportion of immigrant children from nearby cities are significant risk factors for H. pylori infection among youngsters.

Insulin resistance, non-alcoholic fatty liver disease, non-alcoholic steatohepatitis, autoimmune liver and biliary disorders, liver fibrosis, and cirrhosis have all been linked to H. pylori infection in numerous studies. (16).

Our research indicates a significant correlation between hepatic conditions in pediatric patients and H. pylori infection. Hepatomegaly and dyspepsia were more prevalent in children who were infected with

H. pylori. Although there was no apparent hepatic damage indicated by liver enzyme levels, the elevated incidence of fatty liver markers suggests that H. pylori may contribute to the onset of NAFLD.

Previous research has indicated comparable outcomes in adults, linking H. pylori to hepatic illness and metabolic dysfunction. A study by Barakat et al. (5) found H. pylori infection as an independent risk factor for NAFLD in children. Furthermore, H. pylori infection has been associated with a disruption of lipid metabolism, evidenced by a notable elevation of cholesterol and triglyceride levels in the infected individuals observed in our investigation.

A study carried out by De Giacomo et al. (17) that include a school population with a sample size of 808 individuals aged 6 to 19 years established a significant association between severe epigastric discomfort and infection with H. pylori (5.3% vs. 1.7%; OR: 3.2; p = .04). In addition, they reported that fasting discomfort (28.4% vs. 18.7%; OR: 1.7; p = .029), recurrent vomiting (24.2% vs. 14.9%; OR: 1.8; p = .025), and acid reflux (8.4% vs. 3.9%; OR: 2.2; p = .047) were all statistically correlated with H. pylori infection.

Barakat et al. (5) identified H. pylori infection as an independent predictor of NAFLD in the pediatric population (OR 95% CI 5.021 (1.105–22.815). Yan et al. (18) noted a comparable outcome in adults (95% CI 1.02–1.79, OR 1.35, p = 0.036), Sumida et al. (19) (95% CI 1.111–7.644, OR 2.915, p = 0.03), and Mostafa et al. (20) (95% CI 1.967–16.130, OR 5.632, p = 0.001).

This discovery may influence clinical procedures such as screening and management.

In contrast to our findings, a study conducted by Abo-Amer et al. (16) demonstrated that liver enzymes (AST and ALT) were statistically elevated in cases infected with H. pylori compared to those without infection. This corroborates the findings of Sumida et al. (19), who identified a considerable disparity in AST and ALT levels between groups with and without H. pylori infection. This discrepancy may be attributed to variations in the age group of the study population, sample size, and measuring methodology.

H. pylori infection is markedly correlated with increased lipid levels: 8.3% of H. pylori-positive individuals had high total cholesterol (none in the negative group, p=0.043), and 22.9% demonstrated higher triglycerides (2.13% in the negative group, p=0.002). No substantial differences were noted for HDL-C and LDL-C (p > 0.05). A study by Haeri et al. (21) indicated that individuals with H. pylori seropositive status exhibited markedly elevated levels of total cholesterol and triglycerides compared to those without the illness.

Furthermore, the study by Hashim et al. (22) revealed markedly elevated Triglyceride, total cholesterol, and LDL-c values in H. pylori-infected individuals relative to healthy individuals (p < 0.001, p = 0.041, and p < 0.00, respectively). A study by Tindberg et al. (23) done in Korea revealed that H. Pylori is linked to elevated levels of total cholesterol and LDL-c.

Although our work offers valuable insights, specific limitations must be acknowledged. The cross-sectional design inhibits the establishment of causality. Moreover, the dependence on ultrasonography for the diagnosis of NAFLD, albeit non-invasive, exhibits lower sensitivity compared to liver biopsy or MRI evaluations. Future investigations necessitate bigger sample sizes and longitudinal follow-ups to examine this association.

CONCLUSION

Children with H. pylori infection exhibited markedly elevated incidences of hepatomegaly and epigastric pain. Furthermore, H. pylori infection was associated with increased cholesterol and triglyceride levels, indicating a possible contribution to the development of NAFLD. Further work is required to validate these results and explore potential processes behind this connection.

REFERENCES

1. Zhang D, Wang Q, Bai F. Bidirectional relationship between Helicobacter pylori infection and nonalcoholic fatty liver disease: insights from a comprehensive meta-analysis. Frontiers in Nutrition. 2024;11:1410543.
2. ***Jiang T, Chen X, Xia C, Liu H, Yan H, Wang G, et al.*** Association between Helicobacter pylori infection and non-alcoholic fatty liver disease in North Chinese: a cross-sectional study. *Scientific Reports*. 2019;9(1):4874.
3. ***Clemente MG, Mandato C, Poeta M, Vajro P.*** Pediatric non-alcoholic fatty liver disease: Recent solutions, unresolved issues, and future research directions. *World journal of gastroenterology*. 2016;22(36):8078.
4. ***Alkassabany YM, Farghaly AG, El-Ghitany EM.*** Prevalence, risk factors, and predictors of nonalcoholic fatty liver disease among schoolchildren: a hospital-based study in Alexandria, Egypt. *Arab Journal of Gastroenterology*. 2014;15(2):76-81.
5. ***Barakat S, Abdel-Fadeel M, Sharaki O, Shafei ME, Elbanna B, Mahfouz A.*** Is Helicobacter pylori infection a risk factor for non-alcoholic fatty liver disease in children? *European Journal of Pediatrics*. 2025;184(1):1-8.
6. ***Mavilia-Scranton MG, Wu GY, Dharan M.*** Impact of Helicobacter pylori infection on the pathogenesis and management of nonalcoholic fatty liver disease. *Journal of Clinical and Translational Hepatology*. 2023;11(3):670-8.
7. **Dasarathy S, Dasarathy J, Khiyami A et al.** Validity of real time ultrasound in the diagnosis of hepatic steatosis: a prospective study. J Hepatol. 2009; 51:1061–1067
8. **Koletzko S, Konstantopoulos N, Bosman D et al.** Evaluation of a novel monoclonal enzyme immunoassay for detection of Helicobacter pylori antigen in stool from children. Gut. 2003; 52:804–806
9. ***Çınar A, Sadıç M, Atılgan Hİ, Baskın A, Koca G, Demirel K, et al.*** Prevalence of Helicobacter pylori infection in school and pre-school aged children with C-14 urea breath test and the association with familial and environmental factors. *Molecular Imaging and Radionuclide Therapy*. 2015;24(2):66-71.
10. ***Al-Mendalawi MD.*** Seroprevalence of Helicobacter pylori infection among school children in Al Qulubia governorate. *Menoufia Medical Journal*. 2020;33(3):1108-.
11. ***Lin DB, Lin JB, Chen CY, Chen SC, Chen WK.*** Seroprevalence of Helicobacter pylori infection among schoolchildren and teachers in Taiwan. *Helicobacter*. 2007;12(3):258-64.
12. ***Telmesani AM.*** Helicobacter pylori: prevalence and relationship with abdominal pain in school children in Makkah City, western Saudi Arabia. *Saudi Journal of Gastroenterology*. 2009;15(2):100-3.

13. ***Tsongo L, Nakavuma J, Mugasa C, Kamalha E.*** Helicobacter pylori among patients with symptoms of gastroduodenal ulcer disease in rural Uganda. *Infection ecology & epidemiology*. 2015;5(1):26785.

14. ***Biernat MM, Iwańczak B, Bińkowska A, Grabińska J, Gościniak G.*** The prevalence of helicobacter pylori infection in symptomatic children: A 13-year observational study in the lower silesian region. *Advances in Clinical and Experimental Medicine*. 2016;25(2):303-8.

15. ***Ozbey G, Dogan Y, Demiroren K, Ozercan IH.*** Prevalence of Helicobacter pylori in children in eastern Turkey and molecular typing of isolates. *Brazilian Journal of Microbiology*. 2015;46:505-11.

16. ***Abo-Amer YE-E, Sabal A, Ahmed R, Hasan NFE, Refaie R, Mostafa SM, et al.*** Relationship between Helicobacter pylori infection and nonalcoholic fatty liver disease (NAFLD) in a developing country: a cross-sectional study. *Diabetes, Metabolic Syndrome, and Obesity*. 2020:619-25.

17. ***De Giacomo C, Valdambrini V, Lizzoli F, Gissi A, Palestra M, Tinelli C, et al.*** A population-based survey on gastrointestinal tract symptoms and Helicobacter pylori infection in children and adolescents. *Helicobacter*. 2002;7(6):356-63.

18. ***Yan P, Yu B, Li M, Zhao W.*** Association between nonalcoholic fatty liver disease and Helicobacter pylori infection in Dali City, China. *Saudi Medical Journal*. 2021;42(7):735-42.

19. ***Sumida Y, Kanemasa K, Imai S, Mori K, Tanaka S, Shimokobe H, et al.*** Helicobacter pylori infection might have a potential role in hepatocyte ballooning in nonalcoholic fatty liver disease. *Journal of Gastroenterology*. 2015;50:996-1004.

20. ***Mostafa N, Ali A, Alkaphoury M, Marzo R.*** Helicobacter Pylori infection and non-alcoholic fatty liver disease. *Is there a relationship*? 2023:52-9.

21. ***Haeri M, Parham M, Habibi N, Vafaeimanesh J.*** Effect of Helicobacter pylori infection on serum lipid profile. *Journal of lipids*. 2018;18 (1):6734809.

22. ***Hashim M, Mohammed O, Wolde M.*** The association of Helicobacter Pylori infection with dyslipidemia and other atherogenic factors in dyspeptic patients at St. Paul's Hospital Millennium Medical College. *Heliyon*. 2022;8(5):35-42.

23. ***He C, Yang Z, Lu N-H.*** Helicobacter pylori infection and diabetes: is it a myth or fact? *World Journal of Gastroenterology: WJG*. 2014;20(16):4607.