International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Association Between Helicobacter Pylori Infection and Glycemic Control in Type 2 Diabetes Mellitus Patients with Dyspepsia: A Clinicopathological Study

Dr. Priyam Srivastava[1], Dr. Anubha Srivastava[2], Dr. Sandeep Kumar Prajapathi[3]

[1]Junior Resident (Medicine), MLN Medical College, Prayagraj
Email: *drpriyamsrivastava[at]gmail.com*

[2]M.D Medicine, Professor, PG Department of Medicine, MLN Medical College, Prayagraj
Email: *drvarma_anubha[at]yahoo.co.in*

[3]DM Gastroenterology), Assistant Professor, Department of Gastroenterology and Hepatology, MLN Medical College, Prayagraj
Email: *prajapati.sandeepkumar[at]gmail.com*

Abstract: ***Background: Type 2 Diabetes Mellitus (T2DM) is associated with gastrointestinal disturbances, including dyspepsia. Chronic Helicobacter pylori (H. pylori) infection may exacerbate these symptoms and potentially influence glycemic control. This study investigates the relationship between H. pylori infection and glycemic control in dyspeptic T2DM patients, using rapid urease test (RUT), histopathology, and upper gastrointestinal endoscopy. Methods: A cross-sectional analytical study was conducted on 114 T2DM patients aged 35–60 years presenting with dyspepsia. All patients underwent upper GI endoscopy, gastric biopsy for histopathology, and RUT for H. pylori detection. Glycemic control was assessed via HbA1c levels. Statistical analysis included comparison of HbA1c values between H. pylori-positive and negative groups, and correlation with endoscopic and histological findings. Results: Of the 114 patients, 75 (65.8%) tested positive for H. pylori on RUT, and 70 (61.4%) were confirmed by histopathology. The mean HbA1c in H. pylori-positive patients was significantly higher (8.5%) compared to H. pylori-negative individuals (7.4%) (p = 0.005). Endoscopic findings such as erythema, nodularity, and erosions were more frequent in the H. pylori-positive group. Histopathological examination revealed chronic active gastritis in the majority of infected individuals. Conclusion: H. pylori infection is common in T2DM patients with dyspepsia and is significantly associated with poorer glycemic control. Screening and treatment of H. pylori infection in diabetics may improve both gastrointestinal symptoms and metabolic outcomes.***

Keywords: Helicobacter pylori, Type 2 Diabetes Mellitus, Glycemic Control, HbA1c, Dyspepsia, Rapid Urease Test, Endoscopy, Histopathology

1. Introduction

Type 2 Diabetes Mellitus (T2DM) is a global public health concern, affecting over 460 million individuals worldwide. The chronic hyperglycemia characteristic of T2DM leads to multisystem complications, including those affecting the gastrointestinal tract. Dyspepsia is frequently encountered among diabetic patients and may be attributed to autonomic neuropathy, gastroparesis, or underlying infection with Helicobacter pylori (H. pylori).

H. pylori is a microaerophilic, spiral-shaped, gram-negative bacterium that colonizes the human gastric mucosa. It is well known to play a central role in the development of chronic gastritis, peptic ulcer disease, and gastric malignancies. Beyond its classical gastrointestinal manifestations, H. pylori has also been implicated in several extra-gastric conditions, including cardiovascular disease, immune thrombocytopenic purpura, and iron-deficiency anemia.

Emerging literature suggests a potential link between H. pylori infection and glucose metabolism. This may occur through multiple mechanisms, including chronic systemic inflammation, changes in gut hormone regulation (such as ghrelin, leptin, and GLP-1), alteration of gut microbiota, and interference with nutrient absorption. These interactions may be particularly relevant in T2DM, where the metabolic environment is already dysregulated.

Despite the theoretical association, empirical data remains inconsistent, especially in Indian populations where both H. pylori infection and T2DM are highly prevalent. This study aims to evaluate the association between H. pylori infection and glycemic control in T2DM patients with dyspepsia using a comprehensive diagnostic approach.

2. Materials and Methods

Study Design:
This cross-sectional, observational analytical study was carried out in the Department of Medicine at Swaroop Rani Nehru Hospital, M.L.N. Medical College, Prayagraj, over a period of one year.

Institutional Ethical Committee approval was obtained before the commencement of the study. All participants gave written informed consent.

Participants:

Inclusion criteria were:
- Adults aged 35–60 years
- Confirmed T2DM as per American Diabetes Association (ADA) guidelines
- Presenting with symptoms of dyspepsia for more than 4 weeks

Exclusion criteria included:
- Use of antibiotics, proton pump inhibitors, or H. pylori eradication therapy within the past 4 weeks
- History of GI surgery or malignancy
- Severe systemic illness or immunosuppressive conditions

Data Collection:
Detailed demographic and clinical data were collected, including age, sex, duration of diabetes, BMI, socioeconomic status, and current medications. Dyspeptic symptoms were evaluated using the Leeds Dyspepsia Questionnaire.

Investigations:
- Blood Tests: Fasting blood glucose, postprandial glucose, HbA1c, complete blood count, liver and kidney function tests.
- Endoscopy: Performed using a high-definition Olympus endoscope. Gastric mucosa was inspected for erythema, erosions, nodularity, ulcers, and atrophy.
- Biopsy: Two antral biopsies were taken from each patient — one subjected to RUT and the other fixed in 10% formalin for histopathological evaluation.
- RUT: Conducted using commercially available gel-based kits. A color change from yellow to pink was considered positive.
- Histopathology: Sections stained with H&E were reviewed by a pathologist blinded to RUT results. Grading of gastritis, presence of H. pylori, glandular atrophy, and intestinal metaplasia were recorded as per the Updated Sydney System.

Statistical Analysis:
Data were entered and analyzed using SPSS version 23. Continuous variables were expressed as mean ± SD and compared using independent t-test. Categorical variables were expressed as percentages and analyzed using chi-square or Fisher's exact test. Pearson's correlation was used to evaluate relationships between glycemic control and infection status. A p-value <0.05 was considered statistically significant.

3. Results

Baseline Characteristics:
Of the 114 patients enrolled, 74 (64.9%) were male and 40 (35.1%) female. Mean age was 47.8 ± 6.3 years. The mean duration of diabetes was 6.1 ± 2.7 years. Average BMI was 27.1 ± 2.9 kg/m². Most patients were from lower (52%) and middle (41%) socioeconomic strata.

H. pylori Positivity:
- RUT-positive: 75 (65.8%)
- Histopathology-positive: 70 (61.4%)
- Concordance rate: 91.2% (kappa = 0.87)

Glycemic Indices:
- HbA1c in H. pylori-positive group: 8.5 ± 1.2%
- HbA1c in H. pylori-negative group: 7.4 ± 0.9%
- Difference: statistically significant (p = 0.005)
- FBS and PPG were elevated in H. pylori-positive group but not statistically significant

Endoscopic Findings:
- Erythema: 36% of infected patients
- Nodularity: 15.8%
- Erosions: 18%
- Gastric ulcer: 5%
- Normal mucosa: only 22% of H. pylori-positive patients

Histological Findings:
- Chronic active gastritis: 86% of infected cases
- Intestinal metaplasia: 10%
- Glandular atrophy: 7%
- Neutrophilic infiltration: prominent in 61% of positive biopsies

4. Discussion

The study demonstrates a strong association between H. pylori infection and elevated HbA1c in T2DM patients with dyspepsia. The higher prevalence of infection (65.8%) aligns with other studies from India and other developing countries. The concordance between RUT and histopathology was also high, reinforcing the diagnostic reliability of RUT in resource-constrained settings.

Multiple pathophysiological mechanisms may underlie this association:
- Inflammation: Chronic gastric inflammation can lead to systemic cytokine release, promoting insulin resistance.
- Hormonal Dysregulation: Infection reduces ghrelin levels, altering appetite and glucose regulation.
- Gut Dysbiosis: H. pylori affects the composition of gut microbiota, which may influence glucose metabolism.
- Gastrointestinal Motility: Infected diabetics may suffer more from delayed gastric emptying and gastroparesis, complicating insulin and food timing.

The endoscopic findings support that H. pylori infection often presents with mucosal damage even in the absence of classic ulceration. Histopathology remains the gold standard for diagnosis and provides insights into potential precancerous changes.

5. Limitations

- Cross-sectional design limits causal inference
- Lack of follow-up data post-H. pylori eradication
- Single-center, hospital-based sample

6. Recommendations

- Routine screening for H. pylori in dyspeptic T2DM patients
- Consider inclusion of RUT in diabetic evaluation protocols
- Larger longitudinal and interventional studies needed

7. Conclusion

H. pylori infection is significantly associated with poor glycemic control in patients with T2DM and dyspepsia. Early identification and eradication of H. pylori may improve both metabolic and gastrointestinal outcomes. This study supports the integration of gastroenterological assessment in the comprehensive care of diabetic patients.

References

[1] Polyzos SA, Kountouras J, Zavos C. The association between Helicobacter pylori infection and insulin resistance: a review. Helicobacter. 2011;16(2):79-88.
[2] Marietti M, Gasbarrini A, Saracco GM. Helicobacter pylori infection and diabetes mellitus: the 2015 state of the art. Panminerva Med. 2015;57(2):145-150.
[3] Jeon CY, et al. Helicobacter pylori infection is associated with an increased rate of diabetes. Diabetes Care. 2012;35(3):520-525.
[4] American Diabetes Association. Classification and diagnosis of diabetes. Diabetes Care. 2022;45(Supplement_1):S17-S38.
[5] Sugimoto M, Yamaoka Y. The association of virulence factors of Helicobacter pylori with gastric mucosal inflammation and disease. Gastroenterol Clin North Am. 2015;44(2):259-280.
[6] Bener A, et al. Association between Helicobacter pylori infection and glycemic control in patients with type 2 diabetes. World J Diabetes. 2013;4(6):245-249.
[7] Oluyemi A, et al. Endoscopic findings and the prevalence of Helicobacter pylori among dyspeptic patients in Lagos, Nigeria. Gastroenterol Res. 2010;3(3):116-121.
[8] Naja F, Kreiger N, Sullivan T. Helicobacter pylori infection in Ontario: prevalence and risk factors. Can J Gastroenterol. 2007;21(8):501-506.
[9] Wang X, et al. Association between Helicobacter pylori infection and glycemic control in patients with diabetes: a meta-analysis. J Diabetes Res. 2019;2019:6754890.
[10] Patel P, et al. Association of dyspeptic symptoms with glycemic control in patients with type 2 diabetes mellitus. JGH Open. 2020;4(2):246-252.