**Development and Evaluation of a GRDDS for Targeted Treatment of *H. pylori* Infection**

**Moumita Saha1**, Sudheer Moorkoth1, Srinivas Mutalik2, Shiran Shetty3, Raghu Chandrashekar H4, Nandakumar K5

Department of Pharmaceutical Quality Assurance, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education1, Manipal, 576104, Karnataka, India;

Department of Pharmaceutics, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education2, Manipal, 576104, Karnataka, India;

Department of Gastroenterology and Hepatology, Kasturba Medical College, Manipal Academy of Higher Education3, Manipal, 576104, Karnataka, India;

Department of Pharmaceutical Biotechnology, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education4, Manipal, 576104, Karnataka, India;

Department of Pharmacology, Manipal College of Pharmaceutical Sciences, Manipal Academy of Higher Education5, Manipal, 576104, Karnataka, India.

**Background and aims.**

One of the main causes of PUD is untreated *Helicobacter pylori* (*H. pylori*) infection, which can also lead to stomach cancer. Therapeutic challenges arise due to inadequate drug penetration into the inner mucosal layers where *H. pylori* resides, contributing to antibiotic resistance and treatment failure. Current approaches often lead to polypharmacy-related noncompliance. To address this, novel drug delivery systems are needed to improve antibiotic bioavailability at the target site. Gastro-retentive drug delivery systems (GRDDS) offer a potential solution. The goal of the current study is to develop and optimise gastro-retentive mucoadhesive beads for improved treatment and management of *H. pylori* infections.

**Methods.** Mucoadhesive beads were prepared using ionic gelation method. The formulations were characterised by evaluating drug entrapment efficiency, particle size, swelling behaviour, FTIR, DSC, SEM, in-vitro mucoadhesion, and in-vitro drug release. The therapeutic efficacy of the antibiotic-loaded GRDDS formulation was compared to standard treatments by calculating the Colony-forming unit (CFU) counts in isolated gastric tissues.

**Results.** Drug entrapment efficiency exceeded 65% for all formulations. Swelling studies indicated significant swelling over 8 hours, facilitating drug release. FTIR, DSC, and XRD analyses confirmed no drug-polymer interactions. In-vitro release showed over 85% of drug release within 8 hours. The prepared beads exhibited a gastric residence time exceeding 6 hours in rabbits, demonstrating effective mucoadhesion and retention. In-vivo pharmacokinetic data demonstrated higher drug concentrations in the stomach lumen compared to systemic circulation. The in-vivo efficacy study revealed that the antibiotic loaded GRDDS formulation yielded better bacterial eradication than the traditional formulation.

**Conclusion/Discussion.** According to the findings, the prepared mucoadhesive GRDDS beads showed good mucoadhesive qualities, promising sustained release and efficacy in the treatment of *H. pylori* infection. This approach has the potential to minimize polypharmacy approach and help curb the increasing rate of antibiotic resistance.

**Acknowledgements:** The authors are thankful to Indian Council of Medical Research (ICMR) for providing the funding under ICMR-ADHOC fellowship. Authors are also grateful to Manipal academy of higher education, Manipal, Karnataka for providing the facilities.

**References:**

(1) Garza-González E, Perez-Perez GI, Maldonado-Garza HJ, Bosques-Padilla FJ. A review of helicobacter pylori diagnosis, treatment, and methods to detect eradication. World J Gastroenterol. 2014;20(6):1438–49.

(2) Malfertheiner P, Camargo MC, El-Omar E, Liou J-M, Peek R, Schulz C, et al. Helicobacter pylori infection. Nat Rev Dis Primer. 2023;9:1–24. <https://doi.org/10.1038/s41572-023-00431-8>.

(3)Öztekin M, Yılmaz B, Ağagündüz D, Capasso R. Overview of Helicobacter pylori Infection: Clinical Features, Treatment, and Nutritional Aspects. Diseases. 2021;9:66. <https://doi.org/10.3390/diseases9040066>.