

Systematic Review Article

MANAGEMENT STRATEGIES FOR GASTROESOPHAGEAL REFLUX DISEASE IN ADULT AND GERIATRIC POPULATIONS: A SYSTEMATIC REVIEW

Lakshmi Sudhakaran¹, Prithvipriyadarshini Shivalingaiah²

¹General Practitioner, Zulekha Medical Centre, Dubai, United Arab Emirates

²Specialist Gastroenterologist, Medcare Royal Speciality Hospital, Al Qusais 2, Dubai, United Arab Emirates

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Corresponding Author:

Dr. Prithvipriyadarshini Shivalingaiah,
Specialist Gastroenterologist, Medcare Royal Speciality Hospital, Al Qusais 2, Dubai, United Arab Emirates.
Email: lakshmisudhakaran23@gmail.com

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ABSTRACT

Background: Gastroesophageal reflux disease (GERD) is a common, heterogeneous disorder causing troublesome symptoms and complications. With evolving diagnostics, expanding therapeutic options, and specific geriatric considerations, an updated synthesis of evidence is needed. This systematic review evaluates lifestyle, pharmacologic, endoscopic, and surgical management in adults and older patients, focusing on safety, long-term outcomes. **Objectives:** To evaluate the effectiveness and safety of lifestyle, pharmacologic, endoscopic, and surgical therapies for GERD in adults and older patients, and to compare age-related differences in outcomes and adverse effects.

Materials and Methods: This systematic review followed PRISMA guidelines. A comprehensive search of PubMed/MEDLINE, Embase, Scopus, and the Cochrane Library was conducted from inception to the most recent date. Eligible study designs comprised randomized controlled trials, cohort, case-control, and cross-sectional studies, review articles. Non-English articles, studies lacking extractable data, or those without clear outcome measures, editorials, commentaries, conference abstracts, were excluded.

Results: Weight loss and behavioural measures improved reflux outcomes, with obesity increasing risk. Proton-pump inhibitors (PPIs) were most effective for healing and symptom control, while surgery provided durable relief in selected patients but with procedure-related adverse effects. In older adults, atypical presentation and higher complication risk necessitated careful monitoring and judicious PPI use.

Conclusion: GERD management is evolving toward a precision-based, phenotype-guided approach. PPIs remain the cornerstone of therapy, supported by lifestyle modification, while surgery and selected endoscopic options benefit carefully evaluated refractory cases. Ongoing advances in diagnostics and therapeutics are expected to further refine individualized, stepwise management strategies.

Keywords: Gastroesophageal reflux disease, GERD management, Proton pump inhibitors, Lifestyle modification, Laparoscopic fundoplication, Endoscopic therapy, Geriatric population.

INTRODUCTION

Gastroesophageal reflux disease (GERD) is a common and clinically heterogeneous disorder caused by the retrograde flow of gastric contents into the esophagus, producing symptoms (classic

heartburn and regurgitation) and, in many patients, mucosal injury or complications such as erosive esophagitis, peptic stricture, and Barrett's esophagus. Updated document by Katz PO et al., 2022, presents evidence-based recommendations and practical guidance for the diagnosis and management of

gastroesophageal reflux disease (GERD), encompassing medical therapy, lifestyle modification, surgical options, and endoscopic interventions. Functional heartburn and other functional upper gastrointestinal disorders are not addressed in this guideline, and detailed recommendations on esophageal physiologic testing are discussed separately in dedicated guidelines.^[1]

GERD is a heterogeneous disorder with diverse symptoms and complex pathophysiology, making diagnosis challenging. The Lyon Consensus outlines objective esophageal testing criteria that confirm or exclude GERD. When pH monitoring results are inconclusive, additional factors—such as reflux–symptom correlation, high-resolution manometry findings, impedance metrics, baseline mucosal impedance, and response to PPI therapy—can support diagnosis. Despite limitations in current testing methods, this framework provides practical guidance for clinical management (Gyawali CP et al., 2018).^[2]

Lyon Consensus 2.0 defines actionable GERD as disease confirmed by objective testing that justifies modifying or personalizing treatment. It distinguishes unproven GERD, evaluated off antisecretory therapy using prolonged wireless or catheter-based pH monitoring, from proven GERD, where persistent symptoms are assessed with pH-impedance monitoring while on optimized therapy (Gyawali CP et al., 2024).^[3]

For gastroesophageal reflux disease (GERD), standard-dose proton pump inhibitors (PPIs) are more effective than H2-receptor antagonists in patients with erosive esophagitis, and higher doses or longer treatment durations improve healing rates. In long-term management, continuous PPI therapy is superior to on-demand use in patients with esophagitis, whereas both approaches are similarly effective in non-erosive GERD. Long-term PPI therapy is considered safe and demonstrates comparable efficacy to surgical treatment, which carries a higher risk of adverse events and rare mortality (Swedish Council on Health Technology Assessment, 2007).^[4]

Proton pump inhibitors (PPIs) are used for GERD, *H. pylori* eradication, NSAID ulcer prevention, and peptic ulcer disease but are often overprescribed. While generally safe short term, prolonged use has been linked to potential adverse effects. In selected patients, laparoscopic fundoplication may provide better long-term outcomes than chronic PPI therapy and is supported by Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), National Institute for Health and Care Excellence (NICE), and American College of Gastroenterology (ACG). A confirmed diagnosis is essential before invasive treatment, especially in refractory cases (Lata T et al., 2023).^[5]

Clinicians and pharmacists should recognize the potential risks associated with long-term PPI use, including renal complications, cardiovascular events, fractures, infections, micronutrient deficiencies,

hypergastrinemia, possible malignancy risk, hepatic encephalopathy, and cognitive impairment. Patients on prolonged therapy should be periodically monitored for these adverse effects. The American Gastroenterology Association (AGA) advises prioritizing lifestyle measures and H2-receptor antagonists when appropriate, reserving PPIs for clear indications, and considering deprescribing when no definite indication exists (Maideen NMP., 2023).^[6]

Given evolving diagnostic criteria, expanding therapeutic options (endoscopic and surgical), and specific geriatric considerations, a comprehensive synthesis of current evidence that compares effectiveness, safety, and outcomes of management strategies across adult and older populations is warranted. This systematic review therefore aims to (1) summarize and critically appraise the contemporary evidence on lifestyle, pharmacologic, endoscopic, and surgical approaches to GERD in adult and geriatric cohorts; (2) evaluate safety and long-term outcomes, with special attention to PPI stewardship in older adults; and (3) identify gaps in the literature that should inform future research and guideline development.

MATERIALS AND METHODS

The review conducted in accordance with the PRISMA guidelines. A comprehensive literature search was performed using databases including PubMed, Scopus, Web of Science, and Google Scholar using key words Gastroesophageal reflux disease, GERD management, Proton pump inhibitors, Lifestyle modification, Laparoscopic fundoplication, Endoscopic therapy, Geriatric population included. Eligible study designs included randomized controlled trials, cohort studies, case–control studies, and cross-sectional studies, review articles. Non-English papers without extractable data, lacked clear outcome measures or evaluable results, editorials, commentaries, conference abstracts, were excluded. Titles, abstracts, and full texts were independently screened by two reviewers, with disagreements resolved by consensus. Data extraction and quality assessment were performed independently using standardized tools appropriate to study design. Due to heterogeneity among studies, a qualitative synthesis was conducted.

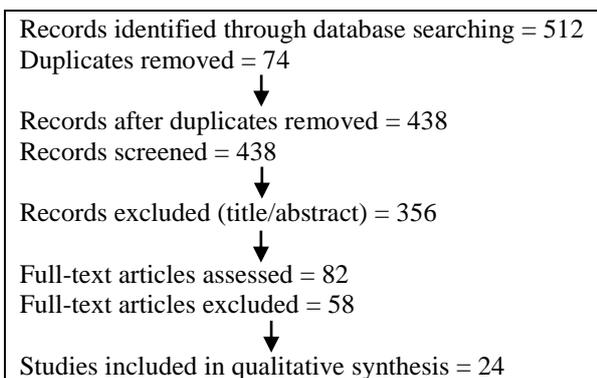


Figure: PRISMA Flow chart of Study Selection Process

RESULTS AND DISCUSSION

GERD is a prevalent condition associated with considerable morbidity and impaired quality of life. Prompt identification of symptoms is essential to reduce the risk of complications. Lifestyle modification and effective acid-suppressive therapy remain the foundation of its management (Clarrett DM et al., 2018).^[7]

1. Lifestyle and Behavioural Interventions

Weight reduction has been associated with significant improvement in gastroesophageal reflux parameters. Two randomized controlled trials demonstrated a decline in esophageal acid exposure time (from 5.6% to 3.7% and from 8.0% to 5.5%), while prospective studies also reported parallel reductions in reflux symptoms. Smoking cessation was linked to symptomatic improvement among normal-weight individuals in a large cohort study (odds ratio 5.67). Additionally, randomized trials showed that consuming late evening meals increased supine acid exposure (5.2% absolute increase), whereas elevating the head of the bed reduced nocturnal acid exposure compared with lying flat (21% to 15%) (Ness-Jensen E et al., 2016).^[8]

Among 206 participants (63% female; mean age 51.4 years) not using acid-suppressive therapy, those with (body mass index) BMI >30 kg/m² had significantly higher esophageal acid exposure, including more frequent and prolonged reflux episodes. Although waist circumference was related to acid exposure, its effect was less consistent. Adjusting for waist circumference weakened the association between BMI and acid exposure. Obesity increases GERD risk by elevating oesophageal acid exposure, with abdominal fat playing a contributory role (El-Serag HB et al., 2007).^[9]

2. Pharmacological Treatment

At 8 weeks, high-dose H₂ receptor antagonists (H₂ RAs) modestly improved healing compared with standard doses (RR 1.17), while standard-dose PPIs were significantly more effective than H₂ RAs (RR [relative risk] 1.59). Healing rates were similar between omeprazole and other PPIs. Overall, PPIs provided superior healing across all grades of esophagitis, including H₂ RA-refractory cases (Wang WH et al., 2005).^[10]

About 70–80% of Erosive Reflux Disease (ERD) and 60% of Non-Erosive Reflux Disease (NERD) patients achieve full symptom relief with PPIs, while 30–40% have partial response after 8 weeks, regardless of dosing frequency. Poor control is linked to long-standing disease, hiatal hernia, extraesophageal symptoms, and non-adherence. PPIs work best before meals (except dexlansoprazole and omeprazole–sodium bicarbonate). Evidence for switching PPIs is limited, with no support for repeated switches in non-responders (Katz PO et al., 2013).^[11]

Across studies (≤12 weeks) by Chiba N et al., 1997, PPIs achieved the highest healing rates (≈84%) compared with H₂RAs (≈52%), sucralfate (≈39%), and placebo (≈28%). Heartburn resolution was also greater with PPIs (≈77%) than with H₂RAs (≈48%). In addition, PPIs produced faster mucosal healing and symptoms relief than H₂RAs or placebo.^[12]

Esomeprazole has shown superior healing rates compared with omeprazole at both 4 and 8 weeks, whereas lansoprazole, pantoprazole, and rabeprazole have demonstrated similar efficacy to omeprazole without significant differences in healing outcomes (Edwards SJ et al., 2001).^[13]

3. Surgical and Endoscopic Options

Surgical options for GERD include laparoscopic fundoplication and bariatric surgery in obese patients, typically considered for those with refractory symptoms, large hiatal hernia, medication intolerance, non-compliance, or documented abnormal acid or non-acid reflux despite PPI therapy. Surgery is most beneficial in patients with typical symptoms such as heartburn and regurgitation who show good PPI response or positive pH correlation, with long-term remission rates comparable or sometimes superior to medical therapy. However, potential risks include short-term postoperative complications, gas-bloat syndrome (15–20%), dysphagia, and inability to belch, although overall complication rates are low and quality-of-life outcomes generally improve after surgery (Katz PO et al., 2013).^[11]

Among 366 enrolled patients with PPI-refractory heartburn, most were excluded after evaluation, with only 78 meeting criteria for true reflux-related, PPI-refractory disease. In this selected subgroup, surgical treatment achieved significantly higher success rates (67%) compared with active medical therapy (28%) and control therapy (12%). Overall, comprehensive assessment showed that only a minority had confirmed refractory GERD, and in these patients, surgery was more effective than continued medical management (Spechler SJ et al., 2019).^[14]

In a study conducted by Lundell L et al., 2009, at 12-year follow-up, 53% of surgical patients remained in continuous remission compared with 45% of patients on dose-adjusted omeprazole and 40% on fixed-dose therapy. However, 38% of surgical patients required a change in treatment strategy versus 15% in the medical group. Heartburn and regurgitation were more frequent with omeprazole, while dysphagia,

gas-related symptoms, and difficulty belching or vomiting were more common after surgery. Overall, both approaches were generally well tolerated.^[15] Galmiche JP et al., 2011 study found that at 5 years, remission was achieved in 92% of patients treated with esomeprazole and 85% undergoing laparoscopic antireflux surgery (LARS), though this difference lost significance after sensitivity analysis. Reflux symptoms were slightly less frequent after surgery, whereas dysphagia, bloating, and flatulence were more common in the surgical group. Mortality was low and unrelated to treatment, and serious adverse events were similar in both groups, indicating that both approaches provide effective long-term GERD control with comparable safety profiles.^[16] Four randomized trials (n = 1,232) indicate that laparoscopic fundoplication offers superior short- to medium-term quality-of-life improvement and better symptom control than medical therapy, though a minority experience postoperative dysphagia. Complications are uncommon but possible, and surgery entails higher initial costs. Long-term durability remains uncertain, so treatment decisions should be individualized (Wileman SM et al., 2015).^[17]

4. Management in Geriatric Patients

GERD is highly prevalent in older adults and often presents atypically, with fewer classic symptoms such as heartburn, increasing the risk of underdiagnosis. Elderly patients are more likely to develop severe erosive esophagitis and complications, often requiring more intensive treatment. Although evaluation and management generally mirror those in younger populations—

primarily centered on acid suppression, with endoscopic or surgical options for refractory cases—age-specific factors must be carefully considered (Kurin M et al., 2019).^[18]

Evidence suggesting a link between PPI use and dementia in older adults is observational and does not confirm causation, despite reports of a modest increased risk and possible biological mechanisms. PPIs have also been associated with fractures, clostridioides difficile infection, pneumonia, vitamin B12 deficiency, and kidney injury, though data are largely non-causal. Given potential risks and frequent overuse, older adults should undergo regular review of PPI necessity, with consideration of dose reduction or discontinuation when appropriate (Maes ML et al., 2017).^[19]

GERD is common in the elderly and often presents with milder symptoms but higher risk of complications due to long-standing acid exposure. Contributing factors include lower esophageal sphincter (LES)-relaxing medications, hiatal hernia, impaired motility, and reduced salivary defence. Early endoscopy is advised, and treatment principles are similar to those in younger adults (Richter JE, 2000).^[20]

PPIs are highly effective for GERD management. Pantoprazole provides reliable healing and relapse control with good long-term tolerability, including in older adults. Optimal long-term dosing remains unclear, but low-dose maintenance should be carefully considered, especially in the elderly (Calabrese C et al., 2007).^[21]

Table 1: Concise Summary of Key Study Findings on GERD Management

| Domain | Author (Year) | Key Findings | Conclusion |
|--------------------------------------|----------------------------|---|---|
| Lifestyle & Behavioral Interventions | Ness-Jensen E et al., 2016 | Weight loss ↓ acid exposure; smoking cessation improved symptoms; late meals ↑ supine acid exposure; head-of-bed elevation ↓ nocturnal acid exposure. | Lifestyle modification improves reflux control. |
| | El-Serag HB et al., 2007 | BMI >30 kg/m ² ↑ esophageal acid exposure and reflux episodes; abdominal fat contributory. | Obesity increases GERD risk. |
| Pharmacological Treatment | Wang WH et al., 2005 | PPIs superior to H ₂ RAs for healing (RR 1.59); similar efficacy among most PPIs. | PPIs provide superior healing across all grades. |
| | Chiba N et al., 1997 | PPIs achieved highest healing (~84%) and faster symptom relief. | PPIs most effective for mucosal healing and heartburn resolution. |
| | Katz PO et al., 2013 | 70–80% ERD, 60% NERD full relief with PPIs; 30–40% partial response. | Limited supporting evidence for switching PPIs |
| | Edwards SJ et al., 2001 | Esomeprazole showed higher healing vs omeprazole; others comparable. | Most PPIs comparable in efficacy. |
| Surgical Management | Katz PO et al., 2013 | Most effective in typical symptoms with good PPI response, achieving long-term remission comparable or superior to medical therapy. | Surgery effective in selected GERD patients |
| | Spechler SJ et al., 2019 | Surgery success 67% vs medical 28% in confirmed PPI-refractory GERD. | Surgery effective in selected refractory cases. |
| | Galmiche JP et al., 2011 | 5-year remission: Esomeprazole 92% vs LARS 85% (no significance after sensitivity analysis); more dysphagia post-surgery. | Comparable long-term control. |
| | Wileman SM et al., 2015 | Fundoplication improved quality of life and symptom control; minority dysphagia. | Surgery beneficial in selected patients. |
| Geriatric Management | Kurin M et al., 2019 | Atypical presentation; higher complication risk. | Careful evaluation required in elderly. |
| | Maes ML et al., 2017 | Observational associations with dementia and other adverse events; causality not established. | Regular PPI review recommended. |

| | | | |
|--|--------------------------|---|---|
| | Richter JE, 2000 | Milder symptoms but higher complication risk; early endoscopy advised. | Management similar but requires early evaluation. |
| | Calabrese C et al., 2007 | Pantoprazole is effective for healing and relapse control with good tolerability in older adults. | PPIs are effective; consider low-dose maintenance in the elderly. |

CONCLUSION

Emerging diagnostic tools and therapies continue to evolve. Novel approaches such as mucosal integrity testing require further validation, while newer interventions and potassium-competitive acid blockers may expand future treatment options. Ongoing advances in endoscopy, surgery, artificial intelligence, and translational research are expected to further shape GERD management (Katz PO et al., 2022).^[1]

Future GERD management should prioritize patient phenotyping using key biomarkers and symptom measures to enable personalized treatment. As diagnostic tools evolve, care is expected to shift toward a precision-based, phenotype-guided approach (Gyawali CP et al., 2018).^[2]

Key updates to the original Lyon Consensus include recognizing Los Angeles grade B esophagitis as definitive evidence of GERD, defining thresholds for prolonged wireless pH monitoring, and incorporating parameters for evaluating refractory GERD during antisecretory therapy in confirmed cases. Criteria with limited diagnostic value have been removed. Emphasis is placed on individualized evaluation and management to improve diagnostic accuracy and treatment outcomes (Gyawali CP et al., 2024).^[3]

Proton pump inhibitors (PPIs) are widely used acid-suppressing medications primarily prescribed for the management of gastroesophageal reflux disease (GERD), where they reduce gastric acid secretion and promote symptom relief and mucosal healing (Maideen NMP., 2023).^[6]

When appropriately indicated, the benefits of PPIs outweigh potential risks; however, unnecessary use makes even small risks clinically relevant. Currently, there is insufficient evidence to support specific strategies to reduce PPI-related adverse effects (Freedberg DE et al., 2017).^[22]

Weight reduction and smoking cessation are recommended for patients with GERD who are obese or smoke, as both measures improve reflux control. For individuals with nocturnal symptoms, avoiding late-night meals and elevating the head of the bed are effective nonpharmacological strategies to reduce nighttime acid exposure (Ness-Jensen E et al., 2016).^[8]

H₂ receptor antagonists are less effective for erosive esophagitis, particularly in severe cases. Standard-dose proton pump inhibitors provide significantly higher healing rates across all grades, with comparable efficacy among different PPIs when used at recommended doses (Wang WH et al., 2005).^[10]

PPIs provide more complete and nearly twice as rapid healing of esophagitis and relief of heartburn compared with H₂RAs. Quantifying the speed of

response allows meaningful comparisons for economic and quality-of-life evaluations (Chiba N et al., 1997).^[12]

In patients referred for PPI-refractory heartburn, thorough evaluation identified true reflux-related, PPI-resistant disease in only a small proportion. In this carefully selected group, surgical management was more effective than continued medical therapy (Spechler SJ et al., 2019).^[14]

Both long-term omeprazole therapy and antireflux surgery are effective and generally well tolerated for chronic GERD. Surgery provides better overall disease control, though postoperative symptoms may persist in some patients (Lundell L et al., 2009).^[15]

Because long-term PPI therapy has been linked to several potential adverse effects, the ongoing need for treatment in older adults should be regularly reassessed (Maes ML et al., 2017).^[19]

Although the optimal long-term dosage is not well established, low-dose maintenance therapy should be thoughtfully considered, particularly in older adults (Calabrese C et al., 2007).^[21]

Surgical indications for GERD remain debated. In addition to medical therapy and fundoplication, endoscopic techniques have emerged to strengthen the lower esophageal sphincter and reduce reflux. These include endoscopic suturing, radiofrequency therapy (Stretta), and material implantation. Short-term results show symptom improvement and reduced acid exposure, but long-term evidence is limited. Management should be individualized based on symptom severity and treatment response (Zhi XT et al., 2005).^[23]

GERD should be managed using a stepwise, individualized approach. Initial treatment includes lifestyle modification and a 4–8 week trial of once-daily PPI, with dose adjustment based on response. Objective testing, including endoscopy and pH monitoring, is indicated for alarm symptoms, PPI failure, or before long-term therapy. Mild cases may respond to optimized medical therapy and dose reduction, while severe or refractory GERD requires long-term, tailored management based on reflux severity and patient-specific factors (Yadlapati R et al., 2022).^[24]

GERD management is shifting toward a precision-based, phenotype-guided approach supported by evolving diagnostic tools. Future studies are needed to validate emerging diagnostics and assess the long-term efficacy and safety of newer therapeutic interventions.

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