INTRODUCTION

Gastroesophageal reflux disease (GERD) is increasing in prevalence worldwide and can be caused by chronic reflux of gastric contents from the stomach into the esophagus, oral cavity, or lungs. GERD patients have a variety of symptoms. Most of them suffer from recurring symptoms of heartburn, belching, and chest pain. Less common symptoms include chronic cough, asthma, difficulty swallowing, and belching. Gastroesophageal reflux disease is caused by dysfunction of the lower esophageal sphincter, whose frequent and prolonged relaxation causes acid reflux. Symptoms of gastroesophageal reflux disease can negatively impact a person’s health-related quality of life and lead to further complications. First, damage can occur to the lining of the esophagus. This can increase the risk of later developing esophageal complications such as erosive esophagitis (EE), Barrett's esophagus, and esophageal adenocarcinoma.

The incidence of GERD is high in the general population, it is estimated to affect up to 20% of the population worldwide. Nowadays GERD is found to be the most common diagnosis made in a gastroenterology practice. However, with knowledge and more specific diagnoses about gastroesophageal reflux disease, these rates have increased and are now being reported at higher rates around the world.

Approximately half of all adults will report reflux symptoms at some time. The diagnosis of GERD is usually based on classic symptoms and response to gastric acid suppression from empirical studies. Gastroesophageal reflux disease is an important health problem as it is associated with decreased quality of life and significant morbidity.

Successful treatment of gastroesophageal reflux disease symptoms results in significant improvements in quality of life, including reduced physical pain, increased energy, and increased physical and social functioning. Lifestyle modification can be an initial approach to managing GERD, such as weight loss, dietary changes, and mealtime practices, followed by pharmacological therapy for those who fail conservative measures.

Comprehensive treatment is needed for patients with a high risk of recurrent GERD symptoms.

Treatment of gastroesophageal reflux disease is primarily drug therapy with antacids, H2 receptor antagonists, PPIs, and surgery (usually fundoplication) in selected patients. Recent evidence indicates that long-term use of PPIs is subject to side effects. Over the past decade, many studies have investigated the long-term side effects (AEs) of PPIs. These include malabsorption of calcium and magnesium, which can lead to an increased risk of bone fractures, vitamin B12 deficiency, which can lead to megaloblastic anemia, and neurological problems. Clostridium difficile infection-associated disease (CDAD) is a side effect of low acidic pH in the stomach. GERD patients often use higher doses and longer durations as recommended by guidelines. The rules of lifestyle intervention take place for minimizing the symptoms of GERD and increasing patient quality of life.

In this article, we provide a comprehensive review of the current...
guidelines on the life style intervention of GERD.

**METHOD**

The databases of PubMed/MEDLINE, ResearchGate, and Sage Journal were searched independently by researchers to explore eligible literature published between database inception and October 2023. All studies on case reports, pediatric patients, or those published in a language other than English were excluded. Randomized Control Trial (RCT), clinical trial, comparison studies, original study were included for assessment. The phrases “GERD” (title) and “lifestyle modifications” (all fields) were used to search the databases.

**RESULT**

Table 1. Resume of Lifestyle Intervention of Gastroesophageal Reflux Disease (GERD)

<table>
<thead>
<tr>
<th>Category</th>
<th>Study</th>
<th>Design</th>
<th>Intervention</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss</td>
<td>Valentini D, et al.</td>
<td>RCT</td>
<td>Population divided into two groups:</td>
<td>Group A: Led to an average weight loss of 4.4 kg (±5.3), average BMI reduction of 1.7 kg/m2 (±2.9) Group B: increase in weight of 2.1 kg (±4.4), an increase in BMI of 1.3 (±6.3) Positive correlation association between weight loss and reduction of symptoms as measured by the GERD-HRQL score (r = .49; p &lt; .001)</td>
</tr>
<tr>
<td></td>
<td>Shing M, Lee J, Gupta N, et al.</td>
<td>Prospective Cohort Study</td>
<td>Weight loss strategy for six months of evaluation in population overweight subjects (BMI 25-39.9):  - Dietary modification  - Increased physical activity  - Behavioral change</td>
<td>Significant correlation between % body weight loss and reduction in GERD symptom scores (r = 0.17, P &lt; 0.05)</td>
</tr>
<tr>
<td></td>
<td>Bortoli N, Guidi G, Martinucci I, et al.</td>
<td>Comparative Study</td>
<td>Obese patients with GERD are divided into two groups:  - Receiving PPI with hypocaloric diet aerobic exercise to achieve 10% weight loss  - Receiving PPI with standard care of diet Observed for six month</td>
<td>Need at least 10% weight loss to improve outcome in PPI used and reduced chronic therapy (P&lt;0.05)</td>
</tr>
<tr>
<td>Dietary factor</td>
<td>Song J, Chung S, Lee J, et al.</td>
<td>Cross Sectional Study</td>
<td>Administered questionnaires about GERD symptoms and dietary habits</td>
<td>Noodles, spicy foods, fatty meals, sweets, alcohol, breads, carbonated drinks, and caffeinated drinks were associated with reflux-related symptoms</td>
</tr>
<tr>
<td></td>
<td>Mone I, Kraja B, Bregu A, et al.</td>
<td>Cross Sectional Study</td>
<td>Population of study (≥18 years) who were assessed for GERD was divided into two groups:  - With Mediterranean diet  - Non-Mediterranean diet</td>
<td>There is a beneficial effect of a Mediterranean diet in the occurrence of gastroesophageal reflux disease</td>
</tr>
<tr>
<td>Meal Timing in Relation to Bedtime</td>
<td>Fujiwara Y, MacHida A, Watanabe Y, et al.</td>
<td>Case-Control Study</td>
<td>Administered questionnaire dinner-to-bed time in patients with GERD symptoms</td>
<td>Shorter dinner-to-bed time was significantly associated with an increased OR for GERD</td>
</tr>
<tr>
<td></td>
<td>Ahmed S, Jamil S, Shaikh H, et al.</td>
<td>Descriptive Cross Sectional Study</td>
<td>The candidates were asked to fill out a validated GERD questionnaire and about their lifestyle factors</td>
<td>Increasing the duration between eating and sleeping relieves heartburn with p-value &lt;0.05</td>
</tr>
</tbody>
</table>
Study Patients and controls completed a Design Result
Ness-Jensen E, Lindam A, Lagergren J, Hveem K.17 Prospective population-based cohort study All residents from 20 years of age who reported had heartburn or acid regurgitation. The association between tobacco smoking cessation and improvement in GERS was assessed by logistic regression Among individuals using antireflux medication at least weekly, cessation of daily tobacco smoking was associated with improvement in GERS from severe to no or minor complaints (adjusted OR 1.78; 95% CI: 1.07–2.97), compared with persistent daily smoking

Alsaleem M, Awadalla N, Shehata S, et al.18 Descriptive cross-sectional Administered GerdQ as a diagnostic tool for the GERD Smoking as one of the significant independent factors associated with GERD (aOR = 2.11, 95% CI: 1.41–5.98)

Loots C, Smits M, Omari T, et al.20 RCT Patients and controls completed a validated GERD questionnaire (Reflux Disease Questionnaire, RDQ), studied twice on separate days and underwent both positioning protocols either LLP or RLP first. Gastroesophageal reflux, (GER) disease patients had increased numbers of TLESRs in RLP compared to LLP in the first postprandial hour [5 (4–14) and 4.5 (2–6) respectively, P = 0.046]

**DISCUSSION**

**Lifestyle Modification**

The goal of treatment for GERD is to address symptoms and prevent complications such as esophagitis, BE, and esophageal adenocarcinoma. Recent evidence regarding possible side effects of drug therapy has renewed interest in lifestyle changes. Lifestyle changes that have been shown to play a role in treating GERD include weight loss, avoiding eating close to bedtime, raising the head of the bed, and smoking, which can worsen symptoms. This includes avoiding harmful habits. Lifestyle changes should remain the first choice of treatment.

a. **Weight Loss**

Obesity is one of the risk factors for the occurrence of GERD (Gastroesophageal Reflux Disease), as indicated by a study showing an increase in body weight in individuals associated with the development of GERD symptoms. The elevated intraabdominal pressure in obese patients, gastric emptying disorders, decreased lower esophageal sphincter pressure, and increased Transient Lower Esophageal Relaxation (TLESRs) in RLP compared to LLP in the first postprandial hour [5 (4–14) and 4.5 (2–6) respectively, P = 0.046]

b. **Dietary Factor**

Dietary intervention in patient with GERD is to avoiding food that potentially may trigger symptoms. Several foods and beverages have been traditionally linked to GERD symptoms, such as acidic food (tomato, citrus), fatty meals, soft drink or carbonated drink, chocolate, and caffeine have been suggested to reduce the pressure of the lower esophageal sphincter, increase esophageal acid exposure times, and increase gastric acid production in some studies. The American College of Gastroenterology (ACG) GERD guideline recommends the full removal of foods that may increase reflux. On that list are chocolate, caffeine, alcohol, citrus and spicy foods.

Diet of low carbohydrate content have reported decreases the lower esophageal exposure to acid as measured by pH monitoring. The Mediterranean diet has been evaluated in prospective trials and suggested to have properties that decrease GERD symptomatology. A study from southeastern Europe found that patients...
not adhering to a Mediterranean diet were more than twice as likely to report GERD symptoms after adjusting for confounders including eating habits.\(^\text{14}\) Diet that contains more protein and fiber has also been suggested to reduce GERD symptoms by causing an increased tone of the lower esophageal sphincter.\(^\text{25-27}\)

c. Meal Timing about Bedtime
Ingesting a meal causes the gastric cavity to distend stimulating mechanoreceptors that increase the frequency of TLERs facilitating the occurrence of reflux. A Japanese prospectively-designed study found that the odds of experiencing GERD symptoms in patients with a meal-to-bed time of less than 4 hours was over 7-fold compared to patients with a meal-to-bed time of 4 hours or more.\(^\text{15}\) Individuals should also be counseled about avoiding meals at least 3 hours before bedtime and maintaining good sleep hygiene as it has been shown that minimal disturbances in sleep are associated with suppression of TLERs, resulting in decreased reflux episodes.\(^\text{28}\)

d. Tobacco smoking cessation
Tobacco can be directly implicated in triggering GERD symptoms. Cessation of tobacco smoking has been linked to significant improvement in reported reflux symptoms in patients with a normal BMI who are on antisecretory therapy.\(^\text{17}\) It has been shown in various studies that that an decrease lower esophageal sphincter pressure during smoking. Its found that the lower esophageal sphincter pressure completely returned to normal 5-8 minutes after smoking cease.\(^\text{29}\)

e. Body Posture
The 2 main factors that influence esophageal acid exposure are the pressure gradient that exists between the gastric cavity and the esophagus, and the LES. The pressure gradient itself is a factor that may propel or drive acid through the esophagus, while the LES pressure creates a mechanical barrier to acid. Studies have shown that the supine position substantially decreases the LES pressure while increasing the frequency of TLERs to the degree that it facilitates the passage of acid into the esophagus. The beneficial effects of elevating the head of the bed with either blocks or wedges when sleeping have been described for over 40 years now.\(^\text{29}\) A crossover RCT of 15 GERD participants, showed that elevation of the head of the bed by a 10 inch wedge decreased esophageal pH <4 time compared to a flat position.\(^\text{30}\)

**Study Limitation**
This study only addresses the role of various lifestyle modification factors in influencing the outcomes of gastroesophageal reflux disease (GERD). Among the various factors discussed, there is no study explained of the superiority of each intervention factor.

**CONCLUSION**
The prevalence of GERD continues to increase. In the initial management of GERD, lifestyle modifications are required, such as weight loss, avoiding late evening meals, tobacco smoking cessation, avoiding meals that trigger reflux, and head of the bed elevation, which have been proven to help reduce the incidence of GERD.

**Author contribution**
PNANS: Conceived and designed the analysis, Performed the analysis of each data, Wrote the paper
IGSAJK: Collecting data, Wrote the paper
IMNANS: Performed the analysis of each intervention factor.

**Conflict of Interest**
None

**Funding**
None

**References**
19. Hamilton JW, Boisen RJ, Yamamoto DT, Wagner JL, Reischelderer M. Sleeping on a wedge diminishes exposure of the esophagus to

This work is licensed under a Creative Commons Attribution