

## **Gastroesophageal reflux disease**

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### ***Story of a patient***

*A 32-y old lady consulted Gastroenterology outpatient with complaint of indigestion. The gastroenterologist took a detailed history, which revealed that she suffered from recurrent attacks of respiratory difficulty with wheeze and had to get tooth extraction three times in last 2-y. There was no family history of asthma. Though, burning sensation in the chest did not bother her much, on specific enquiry she did recall history of this symptom off and on, which she attributed to dietary irregularities and indigestion and managed it herself with antacids. An upper gastrointestinal endoscopy revealed some mucosal damage in lower part of food pipe and herniation of part of stomach into chest which doctor called hiatus hernia. 24-h pH metry revealed gastroesophageal reflux disease. She got no relief with omeprazole 20-mg/day but had partial relief with a dose of 40-mg/day. In consultation with her physician, who diagnosed her having gastroesophageal*

*reflux disease with asthma and dental caries possibly related to acid reflux, she decided to undergo key-hole (laparoscopic) surgery that gave her persistent relief not only to heartburn but also to her dental problem and asthma without any drug.*

### ***What is GERD and how common is it?***

Gastroesophageal reflux disease (GERD) is a common health problem in the community. GERD is symptoms and or damage of food pipe due to reflux of acid from stomach into food pipe. Frequency of GERD in Asia including India might be increasing possibly due to modernization, change in life style and diet.

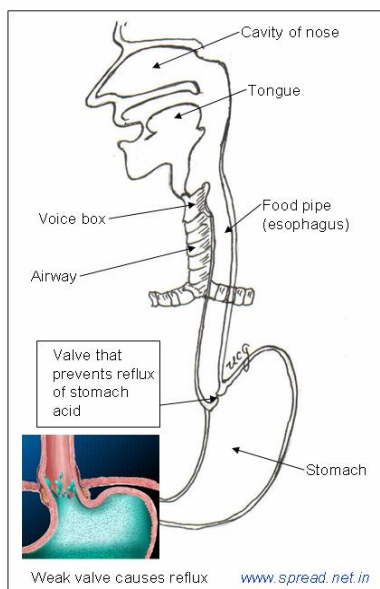
### ***Typical symptoms (Figure 2)***

GERD is a condition mainly caused by backward passage of acidic stomach contents into the esophagus (food pipe, see Fig. 1). Acidic stomach contents harm lower part of the food pipe. These further cause visible damage to esophagus which is called esophagitis.

Patients suffering from GERD complain of discomfort or burning sensation in the chest that arises from the upper part of belly and may go towards the neck (heartburn). They may also have pain in the middle of chest and regurgitation (return of mouthful of liquid with food particles). GERD, if untreated, may lead to narrowing of food pipe (peptic strictures) or a condition called Barrett's metaplasia that may rarely cause esophageal cancer, if untreated.

*Atypical symptoms (Figure 2)*

*Change in voice:* GERD may cause swelling of larynx (the voice box, see Fig. 1) and vocal cords due to its damage by acid causing hoarseness. Hence, GERD should be suspected in patients who have hoarseness of voice.



*Fig. 1. Relationship between airway and food*

*pipe and GERD*

*Asthma:* Refluxed acid going into lungs may cause breathing difficulty especially at night.

If you are suffering from recurrent attacks of respiratory difficulty, particularly non-seasonal and there is no family history of asthma, you should consult your gastroenterologist, get endoscopy and 24-h pH-metry done to see whether your respiratory problem is related to GERD?

*Cough:* GERD can be a cause of chronic cough and pharyngitis. Such patients may ignore their burning sensation in chest as indigestion and my consult ENT specialist and GERD may not be diagnosed.

*Dental caries:* Regurgitation of acid into the mouth can cause dental erosions. Nocturnal reflux of gastric acid can damage the enamel of teeth. Since the injury caused is irreversible, it is important to get the diagnosis of GERD using 24-h pH metry as early as possible to prevent further damage.

*Disturbed sleep:* night-time GERD can cause disturbed sleep.

*Endoscopy in GERD*

GERD can be seen on endoscopy as damaged lower esophagus. However, half of patients with GERD may not have visible esophageal damage on endoscopy. Hence, normal endoscopy does not exclude GERD.

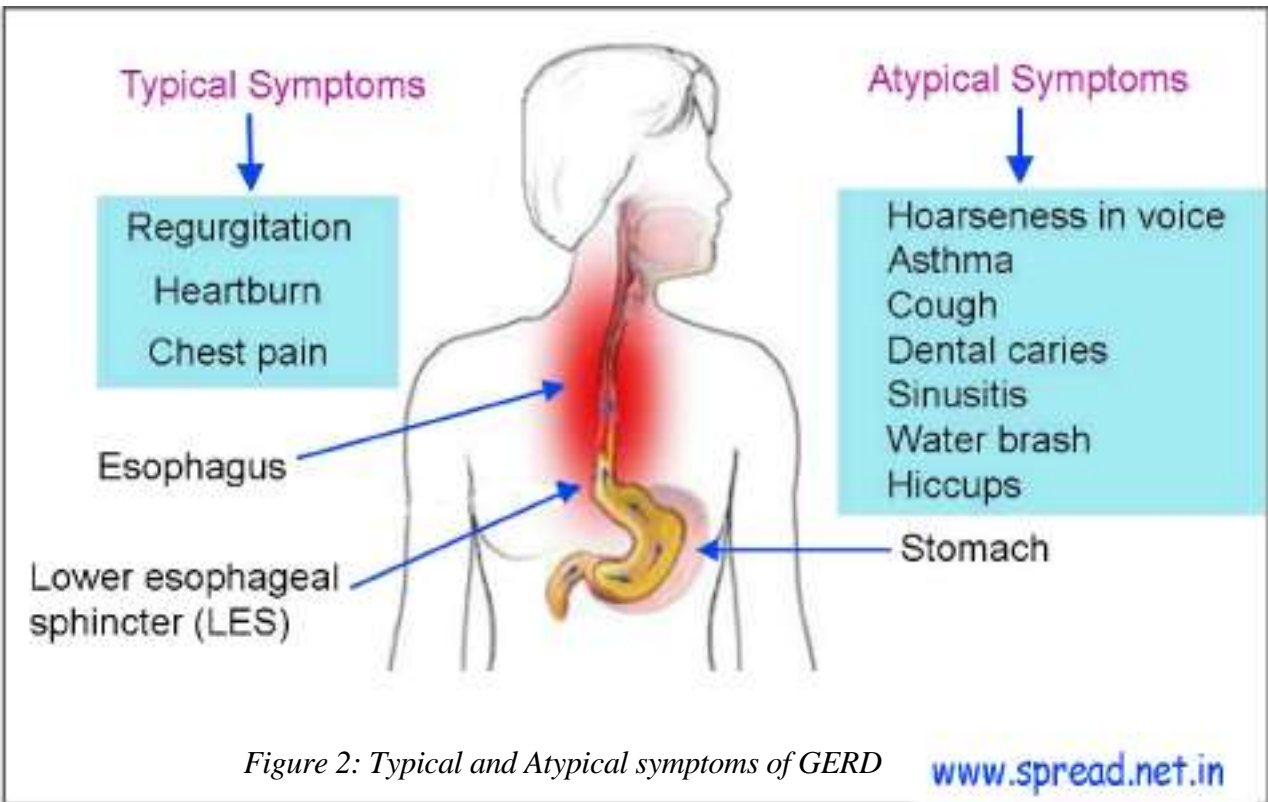


Figure 2: Typical and Atypical symptoms of GERD

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### Risk factors of GERD

Various host, life style and environmental factors are responsible for causing or increasing GERD (Fig. 3).

1. **Transient lower esophageal sphincter relaxation:** This is intermittent relaxation of lower esophageal valve or sphincter (LES, Fig. 1, 2), which leads to the reflux of stomach acid into food pipe. Soft drinks, heavy and fatty meals and pregnancy increase this.
2. **Weakness of the valve in the food pipe:** Some patients with GERD have this defect. Smoking further weakens this valve.

3. **Hiatus hernia:** This condition is protrusion of upper part of stomach into chest. This weakens the valve that prevents reflux of stomach acid from going into food pipe (Fig. 1, 2).
4. **Delayed gastric emptying:** If stomach remains full due to failure of its emptying, there is more reflux. Stomach emptying may be impaired due to excessive intake of green leafy vegetables, excess of fatty foods, isapgula husk, and some other drugs such as sucralfate.
5. **Esophageal acid clearance:** Esophageal movement pushes the refluxed acid back into stomach. It is also neutralized by saliva that contains alkali. Hence, reduced salivation, as occurs during sleep causes more damage to esophagus.

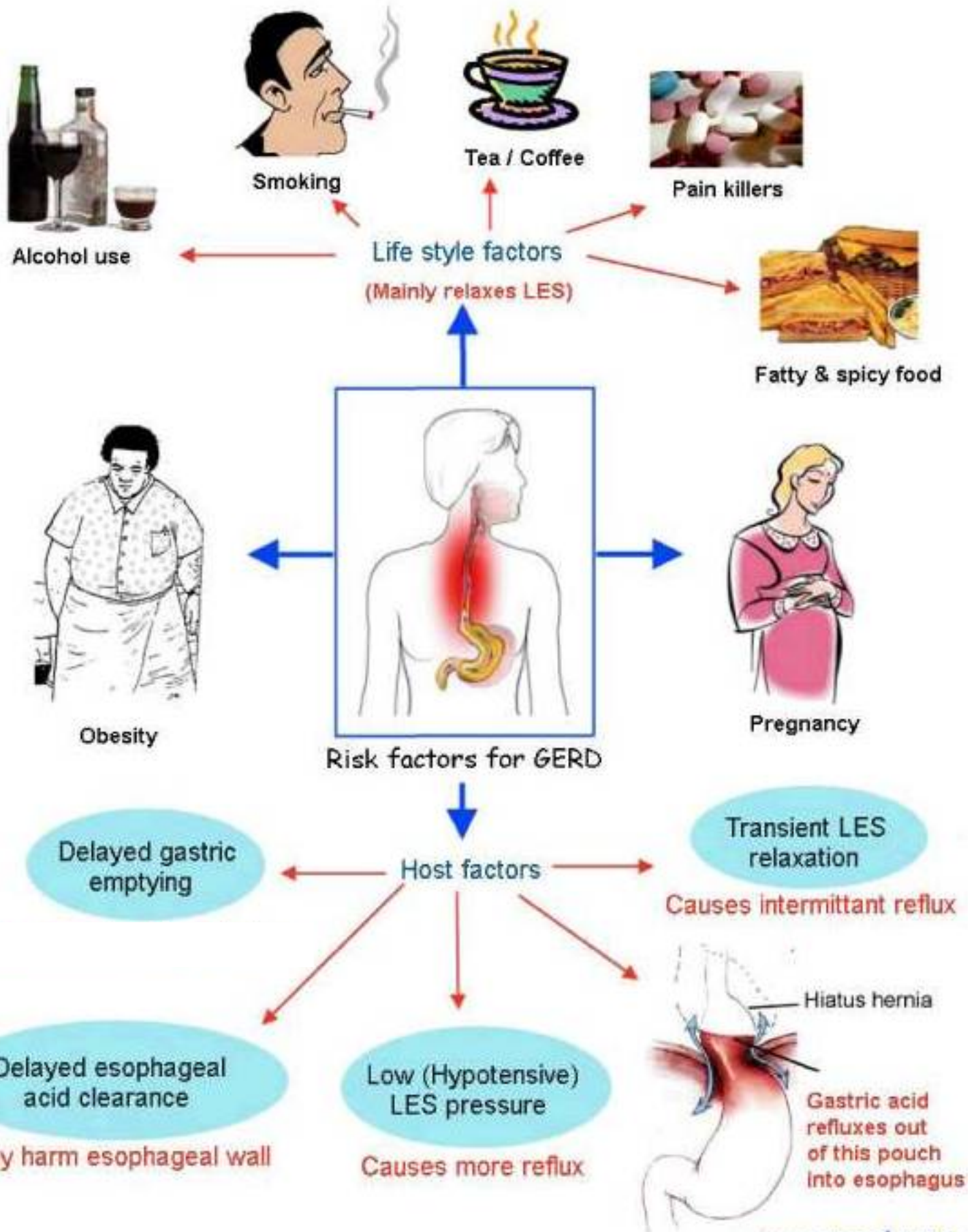


Figure 3: Risk factors for GERD

*Life style factors:* Higher frequency and severity of GERD in developed countries may be due to their life style. Various factors include smoking, alcohol use, fatty and spicy food. This mainly relaxes the LES, thus causing frequent reflux episodes.

*Associated conditions*

*Pregnancy:* Approximately 50% to 80% of pregnant women report heartburn. This mainly results from increased pressure inside the belly pushing stomach contents into esophagus. In addition to this, LES pressure decreases and gastric emptying is slowed.

*Obesity:* It has been shown that the risk for GERD symptoms, esophageal damage and esophageal cancer increases 1.5- to 2.0-fold with obesity compared with normal weight people. Thus, losing excess weight may be important in prevention and treatment of GERD and associated complications.

***How to calculate ideal body weight?***

Ideal weight	For height of 150 cm	For each Cm extra height over 150 Cm
Male	50 kg	1 kg
Female	45 kg	1 kg

***What tests are needed to diagnose GERD?***

In patients with GERD with typical symptoms such as heartburn and regurgitation, doctors may diagnose the disease only by talking with the patients and taking a good history. In patients with atypical symptoms, severe symptoms, complicated disease, disease not responding or only partially responding to treatment with medicines and all patients requiring surgical treatment the doctor may need to do several tests detailed below (Figure 4).

*Endoscopy and esophageal biopsy*

Endoscopy through the mouth is the most common method to diagnose GERD as it provides a means for both detecting and managing complications of GERD as well as excluding the possibility of other diseases. If endoscopy is normal, other investigations including esophageal biopsy may be performed. However, a normal endoscopy does not exclude the diagnosis of GERD.

*Barium swallow*

The test involves filling esophagus with a white liquid material (barium). The x-rays are able to show associated hiatus hernia and complications of GERD like narrowing in the food pipe. However, it is an insensitive test for diagnosing GERD.

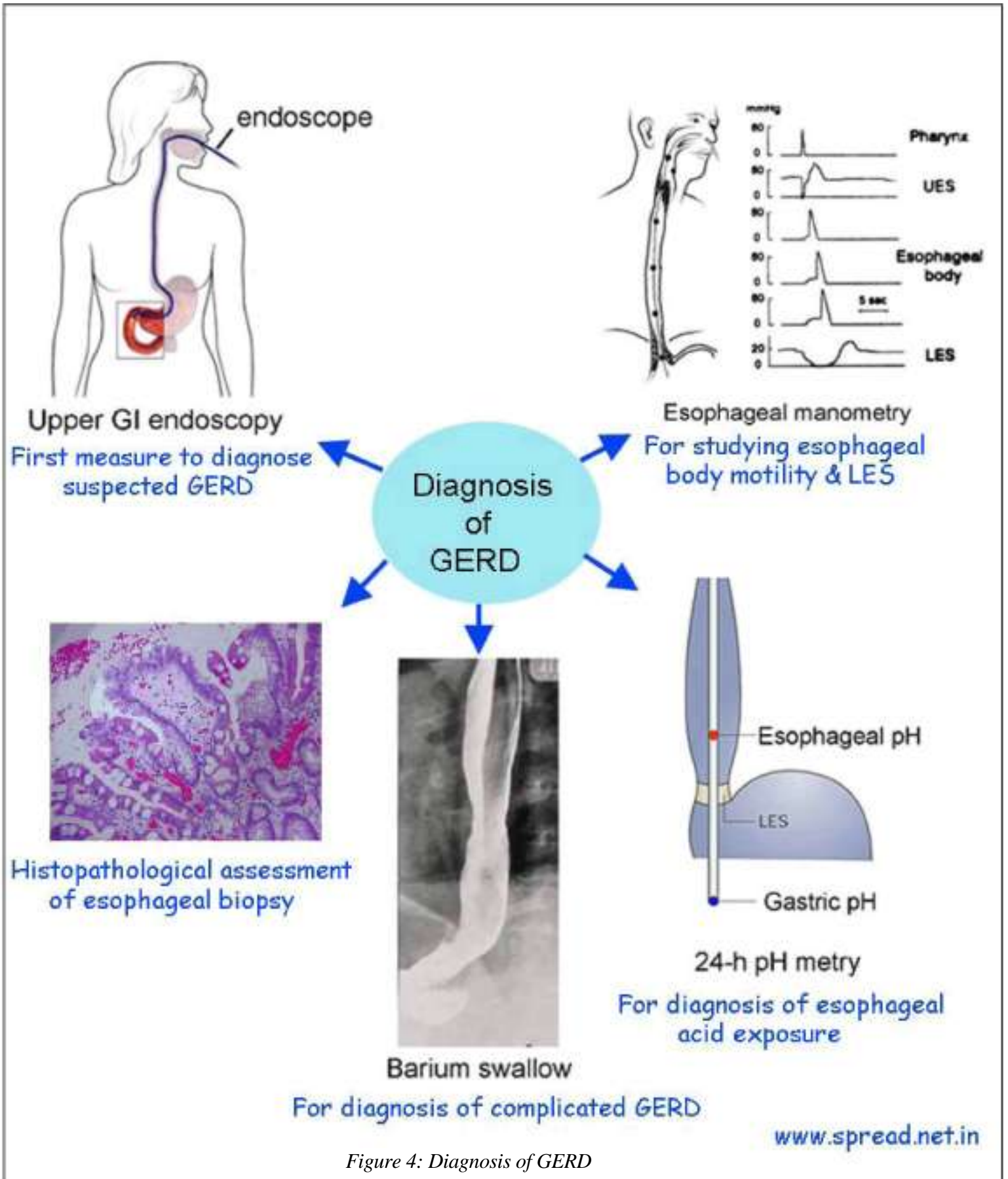


Figure 4: Diagnosis of GERD

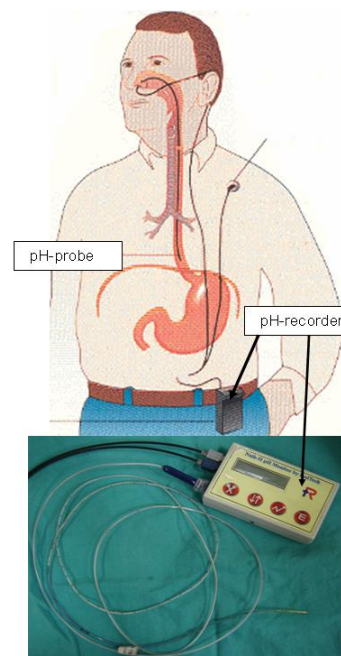
### *24- h pH-metry*

This is a test to evaluate esophageal acid exposure (measured in terms of pH, mathematical way of measuring amount of acidity or hydrogen ion concentration) and is considered "gold standard" for diagnosing GERD. For this test, a small tube (catheter) is passed through the nose and positioned in the esophagus. On the tip of the catheter is a sensor that senses acid (hydrogen ion concentration). The other end of the catheter exits from the nose, wraps back over the ear, and travels down to the waist, where it is attached to a recorder (Fig. 5). Each time acid refluxes back into the esophagus from the stomach, it is sensed by the sensor and the recorder records an episode of reflux. Patient is allowed to perform his/her daily activities during this test. After a 24 hour period of time, the catheter is removed and the record of reflux from the recorder is analyzed. Recently, dual channel pH metry has been used for the simultaneous estimation of gastric as well as esophageal pH.

This test is not only used to diagnose GERD but also used to determine the effectiveness of medications used in its treatment in suppressing acid secretion from stomach.

*What are the situations in which 24- h pH-metry must be done in GERD?*

- GERD presenting predominantly with atypical symptoms
- Assessment of efficacy of treatment in patients presenting with atypical symptoms
- Assessment of persistent symptoms of GERD while on medical or after surgical treatment
- Disturbed sleep suspected to be due to GERD
- Before surgical treatment of GERD



*Fig. 5. 24-h pH metry equipment*

*Preparation for the test*

- Stop medications used for treating reflux and for treating stomach acid problems, unless you are told to continue these medications by your physician.

Some medications such as omeprazole, pantoprazole, rabeprazole, lansoprazole, esomeprazole, famotidine, ranitidine etc. must be stopped for at least 3 weeks prior to the test. Note that your physician may want you to continue these medications up to and during the test to determine how effective they are in suppressing acid production. If so, please take these medications at your regular time of the day prior to the test and the morning of the test (with a little bit of water).

Some medications such as domperidone, itopride, mosapride must be stopped at least 1 week before the test. If you have questions about other medications, talk with your physician.

- Do not eat or drink after midnight the night before the test.
- Wear a shirt or blouse which opens in front so that it is easier to dress after the probe is placed.

*Procedure*

There are two types of pH monitoring. One might be better for you and will be decided by your doctor. Each type uses pH sensors that register the reflux of acid from the stomach into the esophagus. For each type of monitoring, you should try to perform your regular activities during the day, including the ones that may bring on your symptoms. Regular meals should be eaten during the test. Follow your doctor's instructions regarding medication use or avoidance during the test.

*Catheter-based esophageal pH monitoring*

In order to determine the correct placement of the esophageal pH probe, it will be necessary to perform a short test called esophageal manometry before pH-metry.

During 24-h pH-metry a thin wire-sized plastic catheter is passed into one nostril, down the back of the throat, and into the esophagus as the patient swallows (Fig. 5). The tip of the catheter contains a sensor that senses acid. The sensor is positioned in the esophagus so that it is just above the lower esophageal sphincter, a specialized area of esophageal muscle that lies at the junction of the esophagus and stomach and prevents acid from refluxing back up into the esophagus (Fig. 1). Sometimes the probe has other pH sensors to measure pH in the stomach and to measure pH in the upper esophagus. These extra sensors do not change the size of the

small catheter. Placing the probe takes approximately 10 minutes. No sedation is necessary. The other end of the small catheter comes out the nose and is connected to a small battery-powered recorder that is worn on a strap over the shoulder (Fig. 5). The patient is admitted to hospital for 24-h for this test in India. During the 24 hours that the catheter is in place, the patient goes about his/her usual activities, for example, eating, sleeping, and walking. Meals, periods of sleep, and symptoms are recorded by the patient in a diary and by pushing buttons on the recorder. The diary helps the doctor to interpret the results. The patient returns to the laboratory the next morning for removal of the catheter. After the catheter is removed, the recorder is attached to a computer so that the data recorded can be downloaded into the computer where it is then analyzed.

There are very few side effects of esophageal pH monitoring. There may be mild discomfort in the back of the throat while the catheter is in place. The vast majority of patients have no difficulty eating, sleeping, or going about their daily activities.

#### *Wireless, capsule esophageal pH monitoring*

Monitoring esophageal pH can also be performed with Bravo pH monitoring which uses a capsule that is attached to the esophageal lining. The capsule is approximately the size of an eraser on a pencil. The capsule contains an acid sensing probe, a battery, and a transmitter. During an upper endoscopy using conscious sedation, the capsule is introduced into the

esophagus on a catheter through the nose or mouth and is attached to the lining of the esophagus with a clip. The catheter then is detached from the capsule and removed. The probe monitors the acid in the esophagus and transmits the information to a recorder that is worn by the patient on a belt. With this method, there is no catheter protruding from the nose for the recording. For this test, the monitoring period is longer, 48 hours (2 days), which allows more symptom events to be captured. During the recording, the patient goes about his or her usual activities, for example, eating, sleeping, and working. Meals, periods of sleep, and symptoms are recorded by the patient in a diary and by pushing buttons on the recorder. The diary helps the doctor to interpret the results. The patient returns to the laboratory 48 hours after placement and the recorder is attached to a computer so that the data recorded can be downloaded into the computer where it is then analyzed. The capsule will eventually fall off the esophageal lining, usually after five to several days, and is passed in the stool. The capsule is not reusable. The advantages of the capsule device are related to the absence of a catheter connecting the probe to the recorder and the longer duration of the study. There is greater comfort without a catheter in the back of the throat, and patients are more likely to go to work and do more normal activities. One disadvantage of the capsule is that it only measures the pH at one level since it cannot be used in the pharynx or the stomach. It is also costlier.

The capsule device may cause a vague sensation in the chest or discomfort when swallowing. This may be due to food tugging on the capsule as the food passes, although discomfort occasionally can be felt when swallowing only saliva. In rare instances, the Bravo capsule can cause chest pain requiring removal of the capsule with an endoscopy. Patients should not undergo MRI (Magnetic Resonance Imaging) during the test and for 30 days afterwards. Patients with pacemakers in heart, implantable defibrillators or neurostimulators cannot use Bravo. Patients with a history of bleeding diatheses, strictures, severe esophagitis, varices, obstruction, and prior esophageal resection are not candidates for Bravo pH monitoring.

*Esophageal manometry* This is the assessment for esophageal muscle activity. This test is mainly done to localize and measure the LES (lower esophageal sphincter) pressure, and to study any abnormality in esophageal body. For motility testing, a thin tube (catheter) is passed through a nostril, down the back of the throat, and into the esophagus. On the part of the catheter i.e. inside the esophagus are sensors that sense pressure. A pressure is generated within the esophagus that is detected by the sensors on the catheter during contraction of muscles of food pipe. The end of the catheter that

protrudes from the nostril is attached to a recorder that records the pressure. During the test, the pressure at rest and during swallowing liquids of the lower esophageal sphincter are evaluated.

### *Treatment of GERD*

*Antacids:* Antacids neutralize the acid in the stomach and esophagus. The problem with antacids is that their action is brief. Antacids may be aluminum, magnesium, or calcium based. Aluminum-containing antacids have a tendency to cause constipation, while magnesium-containing antacids tend to cause diarrhea.

*Histamine receptor antagonists:* The first medication developed for more effective and convenient treatment of acid-related diseases, including GERD, was histamine (H<sub>2</sub>) receptor antagonist (cimetidine, ranitidine, famotidine, and nizatidine). These suppress acid secretion most effectively during fasting and during sleep.

*Proton pump inhibitors:* Proton pump inhibitors (PPI) are very useful if administered 30 minutes before meals. These available in Indian market include omeprazole, pantoprazole, rabeprazole, lansoprazole and esomeprazole. Long-term intake of these drugs can permanently reduce ability of stomach to secrete acid.

*Prokinetics:* These drugs include domperidone, metoclopramide, itopride and mosapride. Cisapride is not used now-a-days due to its risk of toxic effects on heart.

In severe GERD one may have to take these drugs life-long under medical supervision or may have to consider for surgical treatment.

### *Precautions and Prevention*

Life style changes: This is the simplest way to avoid acid reflux symptoms.

1. Head end of the bed elevated: As it is well known that reflux of acid is more injurious at night than during day as salivation (that helps in neutralizing acid) reduces at night. These problems can be overcome partially by elevating the upper body in bed. The elevation is accomplished either by putting blocks under the bed's feet at the head of the bed or, more conveniently, by sleeping with the upper body on a wedge (Fig. 6). Trying to elevate head end with multiple pillows may not work as the patients tend to slip down from pillows while sleeping at night. Reflux also occurs less frequently when patients lie on their left rather than their right sides

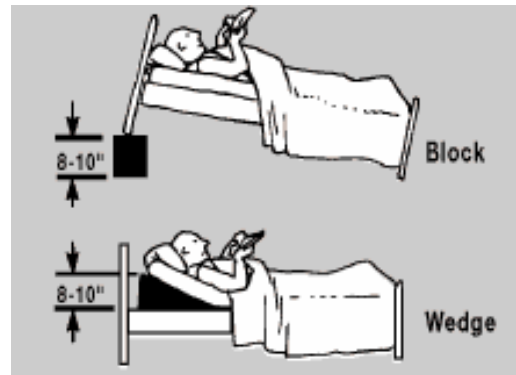


Fig. 6. How to elevate the head end of the bed?

2. *Food habits:* Several changes in eating habits can be beneficial in treating GERD. Smaller and earlier evening meals may reduce the amount of reflux for two reasons. First, the smaller meal results in lesser distention of the stomach. Second, by bedtime, a smaller and earlier meal is more likely to have emptied from the stomach than is a larger one. As a result, reflux is less likely to occur when patients with GERD lie down after the meal has already emptied down from the stomach. Hence, it is advisable to take dinner at least 2-h before going to bed. Certain foods are known to reduce the pressure in the lower esophageal sphincter and thereby promote reflux. These foods should be avoided and include chocolate, peppermint, alcohol and caffeinated

drinks. Fatty foods (which should be decreased) and smoking (which should be stopped) also reduce the pressure in the sphincter and promote reflux. In addition, patients with GERD may find that other foods aggravate their symptoms. Examples are spicy or acid-containing foods, like citrus juices, lemon, carbonated beverages, and tomato juice. These foods should also be avoided.

3. *Chewing gum*: It has been seen recently that Chewing gum stimulates the production of more bicarbonate-containing saliva and increases the rate of swallowing. After the saliva is swallowed, it neutralizes acid in the esophagus. In effect, chewing gum exaggerates the normal process that neutralizes acid in the esophagus. It is not clear, however, how effective chewing gum actually is in treating heartburn.