

Effect of Gastroesophageal Reflux Disease on Pulmonary Function Tests

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Abstract

Background: Gastroesophageal reflux disease (GERD) is a condition in which the esophagus becomes irritated or inflamed because of acid backing up from the stomach. Heartburn and regurgitation are the typical symptoms of GERD. GERD can cause esophageal and extra-esophageal syndromes. Respiratory manifestations of GERD represent one of the most prevalent and challenging of these extra-esophageal syndromes. It is known to be associated with many forms of respiratory diseases, including asthma, pulmonary fibrosis, cystic fibrosis, and obstructive sleep apnea syndrome. The following study is taken up to know the extent to which the GERD affects the lung functions so that it can be diagnosed and treated at the earliest in order to prevent irreversible damage to the lungs.

Objectives: To assess the lung function tests in individuals suffering from Gastroesophageal Reflux disease.

Materials and Method: The study included 30 patients suffering from GERD as cases and 30 subjects not suffering from GERD as controls. Pulmonary function tests of each subject were recorded using Helios 401 spirometer. The results were compiled and statistically analyzed for significant differences.

Results: It was found that the following PFT Parameters FVC, FEV1, PEFR, FEV1/FVC, FEF25-75% were significantly reduced in GERD patients in comparison with controls.

Conclusion: The results of the study conclude that GERD patients have a significantly lower Pulmonary function in comparison with controls.

Keywords: *Gastroesophageal Reflux Disease; Pulmonary Function Tests; Respiratory manifestations of Gastroesophageal Reflux Disease.*

Introduction

Gastroesophageal reflux disease (GERD) is a condition in which the esophagus becomes irritated or inflamed because of acid backing up from the stomach¹. Heartburn and regurgitation are the typical symptoms of

GERD. Somewhat less common are dysphagia and chest pain². Conditions that decrease LES tone or increase abdominal pressure contribute to GERD and include alcohol and tobacco use, obesity, central nervous system depressants, pregnancy, hiatal hernia³.

GERD can cause esophageal and extra-esophageal syndromes, which can co-exist, or not, in the same individual. Respiratory manifestations of GERD represent one of the most prevalent and challenging of these extra-esophageal syndromes⁴.

It is known to be associated with many forms of respiratory diseases, including asthma, pulmonary fibrosis, cystic fibrosis, and obstructive sleep apnea syndrome. It is frequently coexistent and may be

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causative or may exacerbate pre-existing lung disease. The esophagus and lung share common embryonic foregut origins and vagal innervations, and hence it is not surprising that GERD is a potential asthma trigger, a cause of chronic cough, and may impact other lung diseases. There are two major mechanisms by which GERD may influence the lung: a vagally mediated reflex, and microaspiration⁵.

When extraesophageal symptoms due to reflux are suspected, some current guidelines suggest an empiric trial of Proton Pump Inhibitor therapy. The response to antireflux therapy has ranged from 60% to 98% in patients with suspected extra-esophageal reflux related symptoms and studies often have shown mixed result, leading to the confusion regarding importance of association between reflux and extraesophageal symptoms. However, it is possible that airway inflammation and bronchoconstriction due to microaspiration or esophageal refluxes are not the only mechanisms contributing to worsening of respiratory function. Microaspiration of gastric contents into the lungs may cause damage to surfactant with consequent collapse of the alveoli and development of microatelectasis⁶.

Many studies have suggested that treatment of GERD can lead to symptomatic improvement of asthma, less drug use in asthma and improvement in pulmonary function tests⁷.

Hence the following study is taken up to know the extent to which the GERD affects the lung functions so that it can be diagnosed and treated at the earliest in order to prevent irreversible damage to the lungs.

Materials and Method

Source of Data: The study was conducted on 30 patients attending the Department of General Medicine and Department of Respiratory Medicine at Rajarajeswari Medical College and Hospital, Bangalore. GERD was diagnosed based on the presenting symptoms, GERD symptoms questionnaire. The presenting symptoms should be at least for a duration of 6 months. 30 healthy subjects with age, gender and BMI matched served as controls. BMI was calculated by a person's weight in kilograms divided by the square of height in meters (kg/m^2).

Method of collection of data: Data was collected using Helios 401 spirometer, which is used in conjunction with a Windows based computer. 30 Patients diagnosed

with GERD and 30 healthy subjects were selected based on inclusion and exclusion criteria. The procedure was explained and a written informed consent was obtained from the subjects. The following parameters-FVC, FEV1, PEFR, FEV1/FVC, FEF25-75% were recorded after explaining and demonstrating the procedure and three recordings were done and the best of the three was considered.

Inclusion criteria:

1. 30 Patients diagnosed with GERD based on the presenting symptoms, GERD symptoms questionnaire.
2. 30 healthy subjects with age, gender and BMI matched as Controls.

Exclusion criteria:

1. Smokers and tobacco chewers.
2. Patients with ischemic heart disease and diabetes mellitus.
3. Obese individuals
4. Subjects with acute or chronic respiratory disease
5. GERD patients taking medications like antacids, H₂ blockers or proton pump inhibitors.
6. Neuromuscular disorders.

30 Patients coming to the Department of Respiratory Medicine and Department of General Medicine at Rajarajeswari Medical College and Hospital and having the symptoms of GERD and 30 healthy subjects were selected for Pulmonary function test. The test was performed under standard conditions, in sitting position. Three recordings were done and the best of the three was considered. The following parameters-FVC, FEV1, PEFR, FEV1/FVC and FEF25-75% were recorded using Helios 401 Spirometer.

Statistical analysis: The data were compiled in Microsoft (MS) Excel worksheet and analyzed using SPSS (Statistical Package for Social Sciences) software version 20.0. The descriptive statistics-All qualitative variables were presented as frequency and percentages. All quantitative variables were presented as mean and standard deviation. Unpaired t test & Chi square test were the tests of significance applied to know the association between variables and p value of less than 0.05 was considered statistically significant.

Results

Table 1: Age Distribution of Subjects

Age in yrs		P Value
Cases	39.83±4.136	0.34
Controls	38.53±6.118	

Table 1 show that the age distribution of cases and controls are matched (that is the difference between the two groups is statistically insignificant with $P>0.05$).

Table 2: Gender Distribution of Subjects

Chi square test					P Value
Variable		Gerd		Total	
		Cases	Controls		
Gender	Males	14	16	30	0.79
	Females	16	14	30	
Total		30	30	60	

Table 2 show that the number of Males was 14 and number of Females was 16 in Cases; Number of Males was 16 and number of Females were 14 in the Control group suggesting that the subjects were matched for gender with $P>0.05$).

Table 3: BMI (kg/m²) in Cases and Controls

BMI in kg/m ²		P Value
Cases	25.43±3.10	0.324
Controls	26.26±3.39	

Table 3 shows that the average BMI (kg/m²) in Cases and Controls were matched with a P value of 0.324

Table 4: PFT Parameters in Cases and Controls

PFT Parameters	Cases	Controls	P Value
FVC	2.20±0.50	3.18±0.91	0.001*
PEFR	4.58±1.60	6.92±1.86	0.001*
FEV1	1.88±0.31	2.68±0.73	0.001*
FEV1/FVC %	84.65±7.05	89.21±9.77	0.043*
FEF 25-75%	2.24±0.62	3.30±1.16	0.001*

P value ≤ 0.05 -Statistically significant

Table 4 shows that the PFT parameters FVC, FEV1, PEFR, FEV1/FVC% and FEF 25-75% were significantly reduced (P value <0.05) in GERD Patients in comparison with controls.

Discussion

In the Present study there was a significant decrease in PFT parameters-FVC, FEV1, PEFR, FEV1/FVC%

and FEF 25-75% of GERD Patients in comparison with controls. This suggests that there is both Restrictive and Obstructive airway pathology in GERD Patients. A vagally mediated reflex and microaspiration of gastric contents into the lungs may be the mechanisms by which GERD has affected the lungs.

The study is in accordance with the study done by Damir Bonacin et al "Gastroesophageal reflux disease and pulmonary function: A potential role of the dead space extension" who found statistically significant reductions in FVC, FEV1, FEV1/FVC and PEFR in GERD group in comparison with non-GERD group.

In a study done by Manjunath H et al "An Altered Pulmonary Function—A Cause or Consequence of Gastro Esophageal Reflux Disease (GERD)" there was a statistically significant reduction in FVC, FEV1 and PEFR in GERD patients without respiratory symptoms compared to controls ($p < 0.05$).

The aspiration of gastric content into the respiratory passage triggers inflammation with a resultant narrowing of the passage. Chronic reflux may cause the inflammation of the esophagus resulting in cough and bronchospasm mediated through neurogenic mechanism⁸.

GERD typically presents with symptoms of heartburn and regurgitation and less typically with angina like chest pain. Tracheopulmonary manifestations of reflux include chronic hoarseness (reflux laryngitis) associated with inflammation of posterior larynx and vocal cords, nocturnal episodes of nonallergic asthma, chronic cough and sustained hiccups⁹.

GERD has been shown to worsen asthma control through oesophagobronchial reflex, and to heighten bronchial reactivity and microaspiration. GERD has also been reported to be accompanied by neutrophilic airway inflammation¹⁰. For GERD to cause aspiration, gastric secretions and/or bacteria must traverse the LES, esophagus and UES. LES incompetence is most commonly due to transient or chronic reductions in LES tone. The UES represents the final obstacle to aspiration of gastric contents. In patients with aspiration associated with GERD, the resting pressure of the UES is lower than that of normal patients or those with Gastroesophageal reflux alone⁹.

The above study thus concludes that GERD patients have a significantly lower pulmonary function in comparison with controls.

Limitations: In the present study Pulmonary function tests were done on GERD patients who were diagnosed with the help of GERD Symptoms Questionnaire and not by ambulatory 24-to 48-hour esophageal pH recording; the latter being the standard method for diagnosing GERD. Diagnosing GERD with standard method would have resulted in more accurate diagnosis.

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Conclusion

The results of the study conclude that GERD patients have a significantly lower Pulmonary function in comparison with controls.

Conflict of Interest: None

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Ethical Clearance: Permission was taken from Institutional Ethics Committee.

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