

## COMPARISON OF GASTROESOPHAGEAL REFLUX DISEASE IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND BRONCHIAL ASTHMA PATIENTS

Dr. Pankaj Singh Jadon<sup>1</sup>, Dr. Jaswant Goyal<sup>2</sup>, Pragya Gupta<sup>3\*</sup>, Dr. Aryak Singh<sup>4</sup>

1. Assistant Professor, Department of General Medicine, 2. Associate Professor, Department of Pharmacology, 3. Statistician, Department of Community Medicine, Jaipur National University Institute for Medical Sciences and Research Centre, Jagatpura, Jaipur, 4. M.B.B.S., Department of Internal Medicine, SSR Medical College, University of Mauritius, Mauritius.

\*Corresponding author – **Pragya Gupta**

Email id – [Pragyagupt04@gmail.com](mailto:Pragyagupt04@gmail.com)

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### ABSTRACT

**Background:** In this paper, we defined the prevalence of symptomatic gastroesophageal reflux disease in COPD and bronchial asthmatics patients and evaluate the possible relationship between GERD and bronchial asthma and COPD present. **Materials and Method:** The present study is a cross sectional study. In this study, a total of 200 patients selected for COPD and bronchial asthma group were selected by questionnaire method and spirometry. Each group contained 100 patients. Age, sex, diet, economic, addiction and treatment wise study were done in the present study. The result was tabulated and wherever possible, statistically method was applied. **Results:** Overall, 38% (n=38) patients of COPD study population had GERD symptoms, who were taking treatment for COPD is 25% (n=25) patients of total study population, who were not taking any treatment. Overall 42% (n=42) patients of total study population had GERD symptoms, who were taking treatment for bronchial asthma (either inhaled  $\beta$ -2 agonist / inhaled steroid / oral theophylline /all) as compare to 27% (n=27) patients of total study population, who were not taking any treatment. **Conclusion:** High prevalence of GERD symptoms was found in those subjects who were taking treatment for COPD and bronchial asthma. Higher prevalence of hiatus hernia (40.9%) and lax LES (27.3%) was found in those patients, who had symptomatic reflux in COPD group. Higher prevalence or both hiatus hernia plus lax LES (19%) was found in those patients, who had symptomatic GERD in bronchial asthma group.

**Keywords:** Gastroesophageal reflux, Chronic obstructive pulmonary disease, Bronchial asthma

### INTRODUCTION

Gastroesophageal reflux disease is defined as symptoms or tissue injury resulting from exposure of the esophagus to the gastric content. Patients feel burning sensation just below the sternum or feeling of sour, bitter fluid running up to mouth from abdomen. Gastroesophageal disease is a chronic and recurrent disease. It can seriously affect the quality of life. Patients with GERD, present with a variety of symptoms. Typical symptoms of GERD, include

heartburn and acid regurgitations. Atypical symptoms represent a category of manifestations that are not classic and largely include vague abdominal/ epigastric complaints or cardiopulmonary symptomatology such as chest pain, cough, bronchial asthma or laryngitis.

Asthma is defined as a chronic inflammatory disease of airways that is characterized by increased

responsiveness of the trachibroncheal tree to a multiplicity of stimuli. Chronic obstructive pulmonary disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. COPD is currently the fourth leading cause of death in world. COPD is a disease state characterized by airflow limitation that is not fully reversible. In the present study, we found the prevalence of symptomatic gastroesophageal reflux disease in bronchial asthmatics and COPD patients.

Microaspiration of gastric contents and vagal nerve-induced bronchospasm from gastric acid irritation of the esophagus. It may contribute to the observed association with GERD may include pneumonia, pulmonary fibrosis, asthma or chronic bronchitis (3-5). The latter may be a manifestation of COPD, suggesting that GERD may be a risk factor for acute exacerbation of COPD. Acute exacerbations of An acute exacerbation of COPD is defined by the presence of worsening dyspnea, increased sputum production or the development of purulent sputum and may be accompanied by hypoxemia and worsening hypercapina (8-10). Patients with COPD have on average 2.4 to 3 acute exacerbations per year. Risk factors for acute exacerbations include airway irritation from active smoking (4), environmental factors (11-13) and upper respiratory tract infection. In this regard, microaspiration of gastric contents and vagal irritation from gastroesophageal reflux may constitute airway irritants and represents a potential pathogenic mechanism for acute exacerbations of COPD. In this paper, we defined the prevalence of symptomatic gastroesophageal reflux disease in COPD and bronchial asthmatics patients. We evaluated the possible relationship between GERD and bronchial asthma and COPD present.

## **METHODOLOGY**

The present study is a cross sectional study. In this study, a total of 200 patients selected for COPD and bronchial asthma group were selected by questionnaire method and spirometry. Each group contained 100 patients. Performa contained 7 questions for asthma patients and 8 questions for COPD patients. The questionnaire was written at a fourth grade reading level and was thus easily

understood by all patients. The patient with more than 15 years age was taken for bronchial asthma group in the study. The patient with more than 35 years age have selected for the COPD. The smoking history with more than 20 packs per year selected for the study. Forced expiratory volume in one second % predicted ( $FEV1\%pred$ )  $<50\%$   $FEV1/forced$  vital capacity ( $FVC$ ) $<0.7$  were selected as inclusion criteria. History of allergy, rhinitis and family history of asthma was also taken as inclusion criteria for bronchial asthma.  $FEV1$  increases more than or equal to 15% or 200 ml after inhaled bronchodilator or trial of glucorticoid therapy. Exclusion criteria were history of sleep apnoea, any restrictive lung disease and shortness of breath due to cardiac cause. All these patients confirmed by spirometry (SPIROLAB-2 Model), various physical measurements eg. age, height and weight of an individual were used for predicting the expected normal values of various parameters.

It is important for the patients to avoid certain substances such as tea, coffee and chocolates etc before spirometry as they contain caffeine and theobromine having bronchodilatory property. Alcohol should also be avoided for similar reasons. Smoking and exercise are known to cause bronchoconstriction, hence subject should avoid these for a period mentioned above. Heavy meal may prevent the descent of diaphragm resulting in falsely reduced ventilatory parameters, therefore person should avoid heaving meal prior to the test.

These patients were further analysed for GERD symptoms by questionnaire method (Indian society off gastroentrology). If the patients had every symptoms of GERD, the entire Performa was filled. Those patients had symptomatic reflux, were classified as GERD (+), inclusion criteria were number of reflux episodes heart burn and exclusion criteria were peptic ulcer disease, Barrest's esophagus, adenocarcinoma of esophagus.

Selected patients were subjected to upper gastrointestinal endoscopy (olympus co. Japan). Patients were asked to come with empty stomach on the day of procedure. Detailed endoscopic findings were entered in Performa. The result was tabulated

and wherever possible, statistically method was applied.

## RESULTS

In the present study, we take 200 subjects of bronchial asthma and COPD. Age, sex, diet, economic, addiction and treatment wise study were done in the present study. We take 100 subjects for the COPD group. In the COPD group, GERD symptoms were found in 9 patients of 35-44 years age group, 16 patients of 45-54 years age group, 23 patients of 55-64 years age group, 18 patients of 65-74 years age group and 8 patients of more than 75 years age group. The maximum population was from elderly age group that is 55-64 (n=23) and in 65-74 (n=18). The prevalence of GERD symptoms increased with increasing age. In our study, 76.9% (n=70) of total male patients (n=91) and 44.4% (n=4) of total female patients (n=9) were having GERD symptoms. Thus, the prevalence of GERD symptoms was greater in males than females in COPD group. The study population was also divided according to their economic class. Highest 39 patients were having GERD symptoms belong to middle economic class. 68.4% (n=39) of study population out of 57 vegetarian patients and 74.4% (n=32) out of 43 non-vegetarian patients had GERD symptoms. In our study, 53.8% (n=21) of study population out of 39 patients consuming bland diet had GERD symptoms while 78.7% (n=48) out of 61 patients were consuming spicy diet had GERD symptoms. In present study, the prevalence of GERD symptoms was divided according to their addiction or non-addiction. In addiction group GERD symptoms were highly common 80% (n=4) in consuming both tobacco and alcohol. GERD symptoms were more common in 75% (n=9) alcoholics followed by 72.7% (n=48) tobacco users (chewers and smoker). Overall prevalence of GERD symptoms more common in addicts 61% (n=61) than in non addicts 11% (n=11). 75%, 56% and 57.1% patients of treatment taken group had GERD symptoms, who were taking inhaled  $\beta$ -2 against, oral theophylline and both these medicines, respectively. GERD symptoms were also common in 71.4% (n=5) of those patients, who were taking inhaled  $\beta$ -2 against plus inhaled steroid.

Overall, 38% (n=38) patients of COPD study population had GERD symptoms, who were taking treatment for COPD is 25% (n=25) patients of total study population, who were not taking any treatment. Out of 74 of total symptomatic reflux patients, 22 patients were subjected to upper GI endoscopy. Maximum number of patients (40.9%; n=9) had hiatus hernia. 27.3% (n=6) patients had lax LES and in 9.1% (n=2) patients had both hiatus hernia and LALES (lower esophageal sphincter). 22.7% (n=5) patients had normal upper GI endoscopic findings.

In the present study, we take 100 subjects of bronchial asthma. Age, sex, diet, economic, addiction and treatment wise study were done in the present study. In the age wise distribution of study population maximum number of patients (n=17) having GERD symptoms were found in 65-74 age group. 15 patients were in 25-34 age group, 11 patients were in 35-44 age group, 15 patients were in 45-54 age group, 10 patients were in 55-64 age group and 2 patients were found in more than 75 years of age group. In the sex wise distribution of study population 80% (n=44) of total male patients and 71.1% (n=32) of total female patients were having GERD symptoms. Overall GERD symptoms were found in 44% (n=44) males in all age groups and in 32% (n=32) females in all age group (Table 5). In the economical wise study, maximum 51 patients were belongs to middle economical class. The prevalence of GERD symptoms was greater in both higher and middle economic classes as 71.4% (n=5) and 70.8% (n=51), respectively. In our study population, 64.1% (n=41) patients out of 64 vegetarian patients and 86.1% (n=31) out of 36 non-vegetarian patients had GERD symptoms. 73% study population out of 63 patients having GERD symptoms was consuming spicy diet and 67.6% population out of 37 patients having GERD symptoms was consuming bland diet. In the table 6 we show that GERD symptoms were highly common in 81.8% (n=9) patients, those who were consuming tobacco, followed by 75% (n=3) alcoholic patients. But overall prevalence of GERD symptoms more common in non-addict group 58% (n=58) than in addict 14% (n=14). In the table 7,

GERD symptoms were highly common in 83.3% (n=15) of those patients, who were taking all mention medicines. Overall 42% (n=42) patients of total study population had GERD symptoms, who were taking treatment for bronchial asthma (either inhaled  $\beta$ -2 agonist / inhaled steroid / oral theophylline /all) as compare to 27% (n=27) patients of total study population, who were not taking any

treatment. Table 8 shows the number of patients, who had symptomatic reflux in bronchial asthma group. Out of 76 total symptomatic reflux patients, 21 patients were subjected to upper GI Endoscopic findings. 28.6% (n=6) patients had both hiatus hernia and Lax LES. 19% (n=4) and 14.3% (n=3) patients had Lax LES and hiatus hernia, respectively.

**Table1. Age and sex distribution of study population (COPD group)**

Age Group (yr.)	COPD Group				Total
	MALE		FEMALE		
	R(+)	R(-)	R(+)	R(-)	
<b>35 - 44</b>	9	3	0	0	12
<b>45 - 54</b>	16	4	1	1	21
<b>55-64</b>	20	3	3	3	29
<b>65-74</b>	17	7	1	1	26
<b>&gt;75</b>	8	4	0	0	12
<b>Total</b>	70	21	4	5	100

**Table 2. Distribution of study population (COPD group) according to their addiction**

Parameters	COPD GROUP					Total
	Addict			Non-addict (Not taking any of these things)		
	Reflux (+)	Reflux (-)	Total	Reflux (+)	Reflux (-)	
<b>Tobacco chewing and smoking</b>	48 (72.7%)	18 (27.3%)	66	11	6	17
<b>Alcohol</b>	9 (75%)	3 (25%)	12			
<b>Both</b>	4 (80%)	1 (20%)	5			
<b>Total</b>	61 (73.5%)	22 (26.5%)	83	11	6	100

**Table 3. Distribution of study population (COPD group) according to the treatment they had taken**

Treatment	COPD group					Total
	Treatment Taken			Not taken any of these medicine		
	Reflux (+)	Reflux (-)	Total	Reflux (+)	Reflux (-)	
<b>Inhaled Beta-2 against</b>	3 (75%)	1 (25%)	4	25	11	36
<b>Inhaled steroids</b>	0	0	0			
<b>Both</b>	5 (71.4%)	2 (28.6%)	7			
<b>Oral theophylline</b>	14 (56%)	11 (44%)	25			
<b>All of the above</b>	16 (57.1%)	12 (42.9%)	28			
<b>Total</b>	38 (59.4%)	26 (40.6%)	64	25	11	100

**Table 4. Distribution of Reflux (+) COPD patients according to upper gastrointestinal endoscopic findings**

Upper gastrointestinal endoscopic findings	Reflux (+) COPD group
Lax LES	6 (27.3%)
Hiatus hernia	9 (40.9%)
Both of above	2 (9.1%)
Normal study	5 (22.7%)
<b>Total</b>	<b>22</b>

**Table 5. Age and sex distribution of study population (Bronchial asthma group)**

Age Group (yr.)	Bronchial Asthma Group				Total
	MALE		FEMALE		
	R(+)	R(-)	R(+)	R(-)	
15-24	2	1	4	1	8
25-34	9	3	6	0	18
35 - 44	8	0	3	8	19
45 – 54	7	2	8	1	18
55-64	4	1	6	2	13
65-74	12	4	5	1	22
>75	2	0	0	0	2
<b>Total</b>	<b>44</b>	<b>11</b>	<b>32</b>	<b>13</b>	<b>100</b>

**Table 6. Distribution of study population (Bronchial asthma group) according to their addiction**

Parameters	Bronchial Asthma GROUP					Total
	Addict			Non-addict (Not taking any of these things)		
	Reflux (+)	Reflux (-)	Total	Reflux (+)	Reflux (-)	
Tobacco chewing and smoking	9 (81.8%)	2(18.2%)	11	58	24	82
Alcohol	3(75%)	1 (25%)	4			
Both	2 (66.7%)	1 (33.3%)	3			
<b>Total</b>	<b>14 (77.8%)</b>	<b>4(22.2%)</b>	<b>18</b>	<b>58</b>	<b>24</b>	<b>100</b>

**Table 7. Distribution of study population (Bronchial asthma group) according to the treatment they had taken**

Treatment	Bronchial Asthma group					Total
	Treatment Taken			Not taken any of these medicine		
	Reflux (+)	Reflux (-)	Total	Reflux (+)	Reflux (-)	
Inhaled $\beta$ -2 agoinst	2 (66.7%)	1 (33.3%)	3	27	5	32
Inhaled steroids	3(60%)	2 (40%)	5			
Both	21 (52.5%)	19(47.5%)	7			
Oral theophylline	1 (50%)	1 (50%)	2			
All of the above	15 (83.3%)	3 (16.7%)	18			
<b>Total</b>	<b>42(61.8%)</b>	<b>26 (38.2%)</b>	<b>68</b>	<b>27</b>	<b>5</b>	<b>100</b>

**Table 8. Distribution of Reflux (+) Bronchial asthma patients according to upper gastrointestinal endoscopic findings**

Upper gastrointestinal endoscopic findings	Reflux (+) Bronchial Asthma group
Lax LES	4 (19%)
Hiatus hernia	3 (14.3%)
Both of above	6 (28.6%)
Normal study	8 (38.1%)
<b>Total</b>	<b>21</b>

## DISCUSSION

The present study is a cross sectional study. In this study consecutive 100 patients of COPD and bronchial asthma were included. This study provides data on the prevalence of GERD symptoms among the study population according to their age, sex, socioeconomic status, diet grade, addiction and the treatments. The major objectives of present study were to establish the prevalence and symptomatic reflux, based on criteria in the study group. Among the COPD group, majority of the patients (n=49), who were having symptomatic GERD were from elderly age group that is more than 55 years of age group.

Although, COPD is more common in elderly patients and hiatal hernia and altered esophageal motility also occur more commonly in the elderly and this contributes to development of GERD. In this study, many elderly subjects were having hiatus hernia and these subjects further analysed by upper gastro intestinal endoscopy (14).

These findings were in accordance with literature where reflux occurs more commonly in elderly people. The risk factors responsible for higher prevalence of reflux disease in elderly population are altered esophageal motility like decreased peristaltic amplitude, increase non-propulsive, repetitive contraction and lower salivary secretory response in both volume and bicarbonate concentration in older patients.

Molid J.W. et al (15) studied the possible factors that could decrease lower esophageal sphincter pressure and predispose to GERD in elderly. Functional and anatomical diaphragmatic changes have been implicated as important factors in the genesis of GERD related to age. This shows increasing prevalence of GERD symptoms with advancing age.

COPD is more common in males than females. Tobacco smoking is a very important risk factor for genesis of COPD (16-19). In developing countries mostly males are smokers and females are non

smokers. In this study most of the males were chronic smoker and all females never smoked. Smoking is also a risk factor for GERD (20).

In this study 76.9% (n=70) of male patients were having GERD symptoms while only 44.4% (n=4) of females were having GERD symptoms. The study showed that increase prevalence of GERD symptoms in males (Table 1).

In present study, majority of the patients (n=39) were found in middle economic class group but the prevalence of GERD symptoms (75%) were higher in higher economic class group as compare to lower and middle economic class (73.5% and 67.3%, respectively).

In this study, prevalence of GERD symptoms was higher in the non-vegetarians (74.4%) as compared with vegetarians (68.4%) in COPD group. Non-vegetarian diet usually has low fiber and high fat contents. Fat relaxes the lower esophageal sphincter and slows gastric emptying, which are related to gastro-esophageal reflux. In this study, 78.7% subjects having GERD symptoms were consuming spicy diet while 53.8% subjects were consuming bland diet in COPD group.

Laurie Barclay et al. (21) found that, GERD is thought to influence pulmonary function through microaspiration of gastric contents as well as bronchospasm due to acid acid-related vagal stimulation. Previously, GERD has been linked with the etiology or clinical manifestations of asthma, chronic bronchitis, pulmonary fibrosis and pneumonia. COPD is a common pulmonary condition that exacts a tremendous toll in terms of morbidity, mortality and economic cost. In the present study, we examine the incidence of GERD among patients with COPD as well as the effects of GERD on pulmonary function and the rate of COPD exacerbation.

Jacksonville et al (22) discovered that acid reflux is associated with twice as many COPD exacerbations a year compared with patients without acid reflux. In

present study, GERD symptoms were found in 75% of alcoholics, 72.7% of tobacco users and 80% of both alcohol and tobacco users.

Overall, prevalence of GERD symptoms was higher in addicts (61%) than non-addicts (11%). Tobacco smokers have a higher prevalence of lung-function abnormality and respiratory symptoms, a great annual rate of decline in FEV1 and higher death rates for COPD than non-smokers (23-24). Alcohol consumption and tobacco smoking are risk factors for GERD symptoms (5) (Table 2).

Ivan E. et al (25) found that a numerical trend toward a higher number of exacerbations in the smokers with weekly GER symptoms than in those smokers who had no symptoms of GERD, further supporting the association between GER symptoms and exacerbations of COPD. In the present study, 38% patients of total study population had GERD symptoms, who were taking treatment for COPD (either inhaled  $\beta$ -2 agonist / oral theophylline or both) is 25% patients of total study population, who were not taking treatment. In the present study, 75% patients of treatment taken group had GERD symptoms, 56% patients who were taking inhaled beta-2 agonist or oral theophylline and 57.1% patients taking both these medicines (Table 3).

Stein MR et al (27) found that the use of medication like theophylline and beta-2 agonist which may decrease lower esophageal sphincter pressure could facilitate reflux of gastric content. In the present study, higher prevalence of hiatus hernia (40.9%) and lax LES (27.3%) was found in those patients, who had symptomatic reflux in COPD group (Table 4).

Among the bronchial asthma group, the prevalence of GERD symptoms were found almost similar in all age groups, although slightly higher number of symptomatic reflux patients (n=17) were found in 65-74 year age group. In present study population, which consisted of 100 bronchial asthma patients, 55 were males and 45 were females. Symptomatic reflux was found in 80% (n=44) of total males and 71.1% (n=32) of total females. There was slight increase prevalence of GERD symptoms found in males than females.

In present study, majority of the patients (n=51) were found in middle economic class group. The prevalence of GERD symptoms was almost equal as 70.8% and 71.4% in middle and higher economic class group, respectively. The prevalence of GERD symptoms (61.9%) was lower in lower economic

class. In this study, 86.1% of total non-vegetarian patients and 64.01% of total vegetarian patients were having GERD symptoms. In this study, 73% of total spicy diet consumers and 67.6% of total bland diet consumers were having GERD symptoms. Spicy diet irritates the gastric mucosa and increases the acid output which result in characteristic heart burn.

Jack CIA et al (30) found that symptoms of asthma are due to reflux of acid into the oesophagus followed by aspiration into the proximal airway. Animal studies have proven that once the trachea is acidified, there is demonstrable increase in airway resistance. The data in support of this hypothesis include scintigraphic demonstration of aspiration of radiolabelled isotope into the airway in some patients with GOR and respiratory symptoms. Others have been able to show tracheal acidification occurring in concert with oesophageal reflux.

In this study, overall prevalence of GERD symptoms was significantly higher in non-addicts (58%) than addicts (14%). Out of 14% of addicts, 81.8% of tobacco users (smokers and chewers), 75% of alcoholics, 66.7% patients taking both tobacco and alcohol had GERD symptoms. In this study, 42% patients of total study population had GERD symptoms, who were taking treatment for bronchial asthma (either inhaled  $\beta$ -2 agonist / inhaled steroid / oral theophylline or all mention drugs) as compare to 27% patients of total study population, who were not taking treatment. This shows 66.7% patients of treatment taken group had GERD symptoms, who were taking inhaled  $\beta$ -2 agonist. 60% patients, 52.5% patients and 50% patients of treatment taken group had GERD symptoms, who were taking inhaled steroids, both inhaled  $\beta$ -2 and steroid and oral theophylline, respectively.

Crowell M D et al (32) studied the effect of an inhaled  $\beta$ -2 agonist on lower esophageal function and found that it decrease the lower esophageal sphincter pressure could facilitate reflux of gastric content. Higher prevalence of both hiatus hernia plus lax LES (28.6%) and lax LES (19%) was found in those patients, who had symptomatic GERD in bronchial asthma group. In this study, overall prevalence of GERD symptoms was significantly higher in study population.

## CONCLUSION

In present study, we have studied the prevalence of GERD in COPD group and bronchial asthma group. In our study, majority of patients (66.2%) were from elderly age group which is more than 55 years age

group had symptomatic GERD. Higher prevalence of GERD symptoms was found in male patients (76.9% of total males) as compare to female patients (44.4% of total females). Maximum number of patients, who had GERD symptoms, belongs to middle economic class. Higher prevalence of GERD symptoms was found in non-vegetarian patients (74.4% of total non-vegetarians) than vegetarian patients (68.4% of total vegetarians). Higher prevalence of GERD symptoms was found in 78.7% of the spicy diet consumers as compare to 53.8% of the bland diet consumers. Tobacco and alcohol addicts had high prevalence of GERD symptoms than non-addicts. High prevalence of GERD symptoms was found in those subjects who were taking treatment for COPD (drugs like inhaled Beta-2 agoist/inhaled steroid/oral theophylline). Higher prevalence of hiatus hernia (40.9%) and lax LES (27.3%) was found in those patients, who had symptomatic reflux in COPD group. We observed the prevalence of GERD symptoms was found almost similar in all age groups. It shows that bronchial asthma occurs all ages. Both male and female patients had higher prevalence of GERD symptoms. No significant differences in observations were found in both males and females. Majority of patients who had GERD symptoms belong to middle economic class. GERD symptoms were presents in both vegetarian and non-vegetarian patients but non-vegetarian patients had higher prevalence of GERD symptoms than vegetarian patients. Spicy diet consumer had greater prevalence of GERD symptoms than bland diet consumer. Significantly, higher prevalence of symptomatic GERD was found in non-addicts (58%) than addicts (14%). It shows that there is no direct relationship between addiction (Tobacco smoking/ Alcohol Abuse) and symptomatic reflux in bronchial asthma. In present study, it has been observed that the higher prevalence of GERD symptoms was found in those subjects who were taking treatment for bronchial asthma (either inhaled or oral medicines) than those who were not taking any treatment. Higher prevalence or both hiatus hernia plus lax LES (19%) was found in those patients, who had symptomatic GERD in bronchial asthma group.

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#### ABBREVIATIONS

Gastroesophageal reflux disease

Term: GERD

Chronic obstructive pulmonary disease

Term: COPD

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