A Comparative Study on Comorbidities of Hospitalized Chronic Obstructive Pulmonary Disease (COPD) Patients Vs non-COPD Hospitalized Patients.

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Abstract:

Background: Chronic obstructive pulmonary disease (COPD) is predominantly caused by long-term smoking, which results in pulmonary inflammation that is often associated with systemic inflammation. A number of co-morbid conditions, such as cardiovascular disease, type 2 diabetes, muscle wasting, osteoporosis and tuberculosis may coexist with COPD; these and other co-morbidities not directly related to COPD are major causes of excess morbidity and mortality. The aim of this study is to compare the prevalence of co morbidities among the patients of COPD and non COPD patients admitted in a tertiary care hospital. ***Methods:*** Among total patients n=150, Cases were n_1 =75 diagnosed COPD patients admitted in the hospital as per inclusion criteria and control were n_2 =75 non COPD patients admitted in the hospital due to other common diseases. Co morbid diseases were evaluated among the case and control. Data were analyzed by frequency, mean, standard deviation, percentages, odds ratio with the help of computer based software SPSS-15. Odds ratio was considered as statistically significant when it is >1 with confidence interval = 95%. ***Results:*** Co-morbidities were more frequent among the patients of COPD than non COPD hospitalized patients. The results also was statistically significant (Odds ratio=2.6). Common co morbidities were diabetes mellitus, ischemic heart disease, pneumonia, hypertension, lung cancer, and tuberculosis. ***Conclusions:*** In order to provide the best possible care for people with COPD, the physician should be aware of all potential co- morbidities that may arise, and the critical role in effective management of these co-morbidities can play in improving patient outcomes.

Key Words: COPD, Co morbidities, Hypertension, Ischemic Heart Disease

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Introduction

Nowadays, chronic obstructive pulmonary disease (COPD) is considered a major cause of morbidity and mortality worldwide. In contrast to the trend for cardiovascular diseases, cancer and stroke, death rates from COPD have been rising steadily over the last decade[1] and, according to estimates of the World Health Organization (WHO), in a few years this condition shall become the third most frequent cause of death, following coronary and cerebrovascular disease. Its prevalence and mortality are increasing disproportionately among the elderly, women, persons of lower socioeconomic status, and the populations of developing countries like Bangladesh.[2-4] There is increasing recognition that COPD is a complex disorder, with many associated co-morbidities. The term "co-morbid" has traditionally been interpreted as "a medical condition existing simultaneously but independently with another condition in a patient." However, this does not seem to fit the more recent research on patients with COPD as co-morbid conditions occur more frequently in these patients that would be expected by chance. Such conditions include cardiovascular disease (CVD)[5], depression[3], diabetes[6] and Lung cancer[7]. Some of these conditions may be worsened by COPD or complicated by COPD. For instance raised airway glucose concentrations in the airways that may occur in diabetes have been shown to precede an increase of respiratory pathogens[8].

According to American Thoracic Society, Van Manen and colleagues reported that over 50% of 1,145 patients with COPD had 1 to 2 co morbidities, 15.8% had 3 to 4 co morbidities, and 6.8% had 5 or more co morbid conditions[9].Unfortunately, the presence of both COPD and other co morbidities is often ominous and contributes significantly to poor health outcomes[10-13].

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COPD is a leading cause of hospitalizations in adults, particularly older adults[14]. Co morbidities are a common cause, or a contributing cause, to many of these hospitalizations. In the Lung Health Study 12.8% of the 5,887 smokers were hospitalized, with 42% of the hospitalizations secondary to cardiovascular events or pulmonary complications[15]. In the review by Holguin and colleagues co morbidites were frequently reported in hospitalized patients with primary or secondary COPD diagnoses: hypertension 17%, cardiac disease 25%, diabetes 11%, pneumonia 12%, all higher than in the control group(non COPD Patients) [13].

There appear to be a number of mechanisms by which co-morbid conditions arise in patients with COPD other than by chance. The first of these is sharing of common risk factors. These include poor socioeconomic status, smoking and age which are clearly risk factor for a large range of conditions. Indeed half of all people aged 65 years or older have been reported to have at least three chronic medical conditions, and a fifth have five or more[16]. Another mechanism is the increasingly well described systemic effects of COPD[17]. This systemic inflammation is now thought to impact on extra-pulmonary organs such the heart and blood vessels as well as the metabolic system. Finally, COPD treatment may in itself increase the risk of other conditions particularly those related to oral steroid usage.

So what are the implications for management? Clearly, patients need a comprehensive assessment identifying and addressing co-morbidities. This should ideally be provided in a comprehensive way rather than a patient with COPD having fragmented care from a broad range of health professionals. Treatments need to be assessed that may address the systemic effects of COPD such the PDE-4 inhibitors and statins[17].Finally, attempts should be made to minimize iatrogenic effects of COPD treatment particularly, oral steroid therapy is clearly important. COPD co morbidities have a great impact on morbidity, mortality and rate of hospitalization. Addressing the co morbidities individually along with COPD treatment may improve the total health outcome i.e. reduction in morbidity, mortality and rate of hospitalization. We aimed to obtain baseline rates of comorbidites in hospitalized patient with COPD and non COPD patients in Chittagong Medical College Hospital, which may improve the total health outcome.

Materials and methods : Observational analytical type case control study was conducted in the inpatient Department of Medicine, Chittagong Medical College Hospital, Chittagong and fulfilling the inclusion criteria were included as study population. The sample size was case n_1 75 & control n_2 75. The sampling method was non-random. Study period was six months from January 2012 to June 2012. Following common co morbidities were included in this study - Hypertention, Ishcaemic heart disease, pneumonia, tuberculosis, Diabetes mellitus, lung cancer.

For case following criteria was taken as inclusion criteria:

(a) Patients who are currently admitted in medicine wards for an acute exacerbation of COPD.

(b) At least 40 years of age

For control group following criteria was taken as inclusion criteria:

(a) Hospitalized patients with a significant disease other than COPD.

(b) At least 40 years of age.

To diagnose co morbidities-complete blood count, chest X-ray, sputum for AFB staining, gram staining ,malignant cells, FBS & 2HABF,ECG,Echocardiography,CT Scan of chest with CT guided FNAC were done in all patients.

Data collection Methods: All relevant information for each individual study subject was recorded after getting informed written consent on a pre- tested data sheet. Data were collected by the researcher himself.

Data analysis: Data were processed and analyzed by using computer bases software SPSS-15 Different statistical methods like frequency, percentages, mean, standard deviation, odds ratio were applied for data analysis. Odds ratio was considered as statistically significant when it is >1.

Results:

Among total n=150 patients, 104 (69.3%) patients were male and 46(30.7%) of the patients were female. Male to female ratio was 2.26:1. Among the case male was 62(82.7%) and female was 13(17.3%) where as among the control group male was 42(56.0%) and female was 33(44.0%). Regarding the age distribution of total n= 150 patients, minimum age was 42 and maximum was 78. The mean ± S D of age among case was 57.00 ± 9.73 and among control it was 57 ± 10.0 years. The age difference between case and control were not statistically significant ($p<0.05$).

Table-I: Table showing frequency of age

Type of subject*	Number	Mean	Minimum	Maximum	Std. Deviation
Case	75	57.00	43	78	9.713
Control	75	57.80	42	77	10.051
Total	150	57.40	42	78	9.859

Among them house wives were 29(19.3%), day labor were 68(45.3%), office worker were 26(17.3%), retired person was 5(3.3%), businessman was 22(14.7%). Among the n=150 patients cough was found 81(54%) patients, dyspnoea was found 83(55.3%) patients, chest pain was found 24(16.0%) of patients and hemoptysis was found 12(8%) patients. Among them diarrhea was found 13(8.6%) patients, joint pain was found 20(13.3%) patients, epigastric pain was found 30(20%) of patients, fever was found 121(80%) of patients and jaundice was found 10(6.6%) of patients. Sixty percent of patients in cases were current smoker. Past smokers were 35% and very few (5%) were non-smokers. Duration of smoking was 35.2 ± 10.5 years. Number of sticks smoked was 9.7 ± 5.4 sticks per day. Among 13 women in cases all were using biomass fuel for cooking.

Table-II: Risk factors of COPD among the cases

Smoking habit	Frequency	Percentages
Current smoker	45	60%
Past smoker	27	35%
Non-smoker	3	5%
Biomass fuel users	13	17%
Duration		
Duration of smoking(yrs)	35.2 ± 10.5	
Number of sticks smoked daily	9.7 ± 5.4	

Distribution of patients according to primary diagnosis: Among total patients n=150, $n_{1=}$ 75(50%) patients were diagnosed case of COPD. Among $_{n2=75}$ control group, severe malaria was 8(5.3%), enteric fever was 14(9.3%), acute gastroenteritis was 12(8%), acute peptic ulcer disease was 9(6%), rheumatoid arthritis was 6(4%), UTI was 8(5.3%), PUO was 5(3.3%), CLD was 4(2.7%) and HCC was 3(2%).

Distribution of patients according to co morbid diseases:

Regarding analysis of co morbid diseases, hypertension (odds ratio=5.6) was found in 22(14.7%) of patients where more were in case group (18). Ischemic heart disease (odds ratio=2.4) was found 13(8.7%) where more was found in case (9). Pneumonia (odds ratio=5.6) was found 12(8%) among whom more were also in case group (10). Lung cancer (odds ratio=5.6) was also common among the case 10(13.4%). Tuberculosis (odds ratio=3.1) and diabetes mellitus (odds ratio=3.6) was found 8(5.3%) and 24(16%) respectively among the total patients. So Co morbid diseases were found significant with COPD (odds ratio>1).

Table-III: Co morbid diseases of the patients(n=150)

		Type of subject case	Control	Total
Hypertension*	Yes Count	18	4	22
	% within Type of subject	24.0%	5.3%	14.7%
	No Count	57	71	128
	% within Type of subject	76.0%	94.7%	85.3%
Ischemic heart disease*	Yes Count	9	4	13
	% within Type of subject	12.0%	5.3%	8.7%
	No Count	66	71	137
	% within Type of subject	88.0%	94.7%	91.3%
Pneumonia*	Yes Count	10	2	12
	% within Type of subject	13.3%	2.7%	8.0%
	No Count	65	73	138
	% within Type of subject	86.7%	97.3%	92.0%
Lung cancer*	Yes Count	10	2	12
	% within Type of subject	13.4%	2.7%	8%
	No Count	65	73	138
	% within Type of subject	86.6%	97.3%	92%
Tuberculosis*	Yes Count	6	2	8
	% within Type of subject	8.0%	2.7%	5.3%
	No Count	69	73	142
	% within Type of subject	92.0%	97.3%	94.7%
Diabetes mellitus*	Yes Count	18	6	24
	% within Type of subject	24.0%	8.0%	16.0%
	No Count	57	69	126
	% within Type of subject	76.0%	92.0%	84.0%
Total	Count	75	75	150

* Odds ratio >1(Significant)

Relationship of co-morbid disease with among case and control: Among the $n_{1=}$ 75 COPD cases 37(49.3%) patients had co morbid diseases where as among control group 20(26.6%) had co morbid diseases. The association of co morbid disease with case and control was statistically significant (odds ratio=2.6).

Table –IV : Co morbid disease and its relation with case and control (n=150)

			Type of subject n=150 Case $n_{1=75}$	Control $n_{2=75}$	Total	odds ratio
Co morbid diseases	Present	Count	37	20	57	2.6
		% within Type of subject	49.3%	26.6%	34.7%	
	Absent	Count	38	55	93	
		% within Type of subject	50.7%	73.4%	65.3%	
Total		Count	75	75	150	
		% within Type of subject	100.0%	100.0%	100.0%	

Discussion:

Chronic diseases, including cardiovascular disease, cancer, chronic respiratory diseases and metabolic syndrome (hypertension, diabetes, dyslipidaemia) are increasing in the developed countries and result in a substantial economic and social burden. The cost of individual chronic diseases increases exponentially in patients with two or more co

morbid chronic diseases ; almost half of all elderly people (>65 yrs) have at least three chronic medical conditions, and one fifth have five or more. Patients with two or more chronic diseases account for only 26% of the population but for .50% of the overall costs. COPD is associated with chronic heart failure (CHF) in >20% of patients; there is overwhelming evidence from large-scale epidemiological studies demonstrating that impaired forced expiratory volume in one second is a powerful marker of morbidity and mortality and, particularly, of cardiovascular mortality[18].

The present study was done with $n_{1=}$ 75 diagnosed patients of COPD who were considered as case and $n_{2=}$ 75 non COPD patients having other diagnosis. Among the total n= 150 patients, male was 104(69.3%) and female was 46(30.7%). Among the case group there were more male (82.7%). As COPD more common among cigarette smoker and in our country male are more smoker so this findings were consistent with the pattern of common population of Bangladesh done in previous study by Hasan et al[19].

Mean age of the patients was 57± 10 years. As all patients were taken above 40 years and COPD is most common in 50-60 years, this findings also correlate with the population parameter of Bangladesh[20]. Matching with age was done so control group also had the same mean age.

Most of the patients had day labor as occupation. Next to it was house wives and business respectively. As in government hospital poor patients come to take the health care this findings also correlate with the population parameter of Bangladesh[20].

Urinary tract infection, gastroenteritis, malaria, pyrexia of unknown origin, hepatocellular carcinoma, enteric fever, peptic ulcer disease, Rheumatoid arthritis, CLD were the non COPD disease among the control patients. Distribution of such disease were also common disease pattern in the hospitals of Bangladesh[20].

Regarding analysis of risk factors of COPD, 60% of patients in cases were current smoker, past smokers were 35% and very few (5%) were non-smokers. Duration of smoking was 35.2 ± 10.5 years. Number of sticks smoked was 9.7 ± 5.4 sticks per day. Among the $n_{1=}$ 75 cases, male patients were 62, all of whom were found smoker, on the other hand among 13 COPD female, 10 were found smoker and 3 were non smoker. Among all 13 women of COPD were using biomass fuels for cooking. From this scenario it can be said that combination effects of smoking and biomass fuel are acting as important risk factors for COPD among female.

Regarding analysis of co morbid diseases, hypertension (odds ratio=5.6) was found in 22(14.7%) of patients where more were in case group (18). Ischemic heart disease (odds ratio=2.4) was found 13(8.7%) where more was found in cases (9). Pneumonia (odds ratio=5.6) was found 12(8%) among whom more were also in case group (10). Lung cancer (odds ratio=5.6) was also common among the case 10(13.4%). Tuberculosis (odds ratio=3.1) and diabetes mellitus (3.6) was found 8(5.3%) and 24(16%) respectively among the total patients. So Co morbid diseases were found significant with COPD (odds ratio>1 with confidence interval 95%). These findings of present study is consistent with a previous study where hypertension 17%, cardiac disease 25%, diabetes 11%, pneumonia 12%, all higher than in the control group(non COPD Patients) [14].

Co morbidities found among the case and control were diabetes mellitus, hypertension, ischemic heart disease, pneumonia, lung cancer and tuberculosis. Among the 75 COPD cases 37(49.3%) patients had co morbid diseases where as among control group 20(26.6%) had co morbid diseases. On analysis of case and control a clear statistically significant relation was found with co morbidities with COPD (odds ratio=2.6). Non COPD patients had less co morbidities than the COPD patients. These finding is consistent with previous study where the COPD patients had an average of 3.7 co morbidities versus 1.8 for the control subjects (non COPD patients) [10].

Some patients were found to have more than one co morbid diseases. Total numbers of co morbidities were 66, among 37(49.3%) COPD patients in case group. Only one co morbidity were found in 17(22.6%) patients, two co morbidities were found among 11(14.6%) patients and 3 co-morbidities were found among 9(12%) patients. These findings of present study is consistent with a previous study where 50% of 1,145 patients with COPD had 1 to 2 co morbidities, 15.8% had 3 to 4 co morbidities, and 6.8% had 5 or more co morbid conditions.[9]

COPD can no longer be considered a disease only of the lungs It is associated with a wide variety of systemic consequences, most notably systemic inflammation. A better understanding of its origin, consequences and potential therapy will most likely prove to be of great relevance and lead to better care of patients with COPD. The origin of systemic inflammation in COPD is unresolved,

although several potential mechanisms have been proposed. Since smoking remains the major risk factor for the development of COPD and of the associated systemic inflammation, the study of the effects of smoking represents the best model for unraveling the underlying mechanisms of COPD and the consequences of systemic inflammation induced by smoking. In fact, cigarette smoke may cause systemic inflammation irrespective of COPD, and systemic inflammation in smokers may contribute significantly to the development of cardiovascular diseases, particularly atherosclerosis. Systemic inflammation may lead to a lack of response to nutritional supplementation , further contributing to the development of cachexia.[19]

Systemic inflammation may also explain why patients with COPD have an increased risk of developing type2 diabetes. Some aspects of inflammation can predict the development of diabetes and glucose disorders, while fibrinogen, circulating white blood cell count and lower serum albumin predict the development of type 2 diabetes. Furthermore, patients with noninsulin-dependent diabetes mellitus have increased circulating levels of TNF-a, interleukin (IL)-6 and CRP, which are also risk factors for cardiovascular events in males and females. Diabetes is independently associated with reduced lung function, which together with obesity could further worsen the severity of COPD. The complex interaction between smoking and obesity in the development of chronic co morbidities has been recently reviewed. Patients with COPD have an increased risk of developing osteoporosis even in the absence of steroid use; vertebral fractures are present in 50% of steroid-nave males with COPD[18]. For time and resource limitation osteoporosis was not analyzed in the present study.

Conclusion:

The routine screening of patients with COPD for the presence of all potential co-morbidities is not currently recommended in COPD management guidelines. However, GPs should be aware that multiple co-morbidities may coexist in their patients with COPD and that assessment of these patients should not end with the measurement of pulmonary function and health status. Increased vigilance is needed to ensure that co-morbidities are recognized and, where possible, managed appropriately**.**

Limitation of the study:

1. Small sample size.
2. Possible confounding factors may influenced the non COPD control groups
3. Only one center was involved.
4. Due to resource limitation osteoporosis could not be evaluated

Recommendations

1. Regular check up of the COPD patients for evaluation of co morbidities
2. Proper control of COPD
3. Early intervention of co morbid condition with COPD to reduce mortality and morbidity
4. Large scale multicenter trial to evaluate the national health burden of co morbidities among COPD patients

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