ECG Changes of the Patients of Chronic Obstructive Pulmonary Disease

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ABSTRACT

Background: *Chronic Obstructive Pulmonary Disease (COPD) is one of the major health problems and causes of chronic morbidity and mortality worldwide, including Bangladesh. COPD is a preventable and treatable disease which occurs mainly due to longtime smoking, which is also a major public health problem worldwide. Rise in morbidity and mortality from COPD will be the greatest in Asian and African countries as a result of the increasing trend of tobacco consumption in these regions. A timely assessment of the cases of COPD would prevent many of the long-term complications of these patients. In the present study, Electrocardiography (ECG) was performed to observe changes among the patients with COPD. This study is conducted to observe ECG changes of the patients with COPD.* ***Methods:*** *It was an observational study carried out among the patients with COPD in the In-patient and out-patient Department of Medicine, Rajshahi Medical College Hospital, and Rajshahi for two years from July, 2010 to June, 2012. According to inclusion and exclusion criteria, 64 consecutive cases of COPD, both males and females, aged within 40-70 years were selected. Thorough history, physical examination, Lung Function Test (Spirometry) and ECG were done.* ***Results:*** *Among the 64 cases, 22(34.4%) showed ECG changes and 42(65.6%) had normal ECG. Observed ECG changes were Right axis deviation, P-pulmonale and Right Ventricular Hypertrophy (RVH).* ***Conclusion:*** *ECG changes would help in early detection of cardiac morbidity among those patients and manage them accordingly.*

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INTRODUCTION

Chronic obstructive pulmonary diseases (COPD) are one of the chronic disabling diseases of the lungs. This disease is a major health problem and a cause of chronic morbidity and mortality worldwide, including Bangladesh.[1]

COPD is a preventable and treatable disease with some significant extra pulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. COPD is caused by a mixture of small airway disease (Obstructive bronchiolitis) and parenchyma destruction (emphysema), the relative contributions of which vary from person to person.[2]

Most common COPD patients are middle aged or late adults and longtime smokers. Among the risk factors, tobacco smoking, either active or passive, current or previous, have impact with a higher respiratory symptoms and lung function abnormalities, a greater annual rate of decline in forced expiratory volume in 1st second (FEV_1) and a greater COPD mortality rate than those among the non-smoker cases. Other factors includes occupational dusts and chemicals, indoor and outdoor air pollution (almost equal in men and women in developed countries), childhood infection and socio-economic status.[3] Overall prevalence of COPD varies across countries; it is appreciably higher in smokers and ex-smokers compared with non-smokers, in those older than 40 years compared with those younger than 40 years and in men compared with women.[4,5]

Recently, it has been realized that COPD, is associated with a number of co-morbidities, e.g. ischaemic heart disease, hypertension, diabetes, heart failure and cancer. COPD is the 4th of the most important causes of death and is predicted to be 3rd most common cause of death and 5th most common cause of disability worldwide by 2020.[3]

According to a study known as BOLD-BD[1] on COPD conducted by Bangladesh lung foundation, burden of COPD in Bangladeshis can be predicted by the following findings:

prevalence in >40 years of age was 21.24% and prevalence in general population was 4.3%. So, this study is conducted to find out the ECG changes in COPD patients.

METHODS

This observational study was conducted in the Department of Medicine both indoor and outdoor, Rajshahi Medical College Hospital, Rajshahi, during a period of two years from July, 2010 to June 2012. All patients fulfilling the inclusion and exclusion criteria were included as cases. Inclusion criteria were the cases of COPD, aged between 40 to 70 years. Both male and female were enrolled. Exclusions were age less than 40 years and more than 70 years. Patients having other co-morbidities viz. ischaemic heart disease, chronic kidney disease, chronic liver disease, valvular heart disease and hypertension were also excluded. Sample size was 64 cases, in coherence with the prevalence of the disease in the general population in Bangladesh to be 4.3%.

This study was intended to observe the electrocardiographic (ECG) changes among the patients of chronic obstructive pulmonary disease (COPD). All the cases had undergone complete history taking, physical examination and spirometric examination. Among the suspected cases, an initial screening spirometry was done without using bronchodilator inhalation and the cases showing significant obstruction were having either COPD or Bronchial Asthma. Among the obstructive cases, post-bronchodilator spirometry was done to select the cases with irreversible obstruction, i.e., COPD (FEV_1 increment <15%) and to exclude the cases with reversible obstruction i.e. bronchial asthma (FEV_1 increment 15%). Then staging of COPD was done according to GOLD's criteria (2009). ECG

was done among the COPD cases to observe changes.

Data were collected after taking informed consent of the patients. The data was analyzed with the help of SPSS (Statistical Package for Social Science) software program version 16.0. Descriptive analytical technique involving frequency distributions, computation of percentage was applied. Association between variables was conducted applying statistical tests. P-value of <0.05 was considered significant.

RESULTS

Among the 64 cases of COPD under this study, 19(29.7%) were aged between 40-50 years, 18 (29.7%) were between 51-60 years and the remaining maximum group of 27(42.2%) cases were between 61-70 years (Table I).

There was only 1(1.7%) female case of COPD and, all other cases (63,98.4%) were males (Table II).

Maximum cases of COPD were farmers 55 (85.9%), followed by businessmen 5(7.8%) and service holders 4(6.3%). (Table III).

Table I: Age distribution of the cases of COPD

Age group (years)	Cases of COPD (n-64)	
	Number	%
40-50	19	29.7
51-60	18	28.1
61-70	27	42.1
Total	**64**	**100**

Table II: Sex distribution of the cases of COPD

Sex	COPD (n-64)	
	Number	%
Male	63	98.4
Female	01	1.6
Total	**64**	**100**

Table III: Occupation distribution among cases of COPD

Occupation	COPD (n-64)	
	Number	%
Farmer	55	85.9
Businessman	05	7.8
Service	04	6.3
Total	**64**	**100**

Some 59(92.2%) cases of COPD had normal mean QRS axis and 5 (7.8%) had right axis deviation but no case had left axis deviation. (Table IV).

Table IV: Mean QRS axis in ECG among cases of COPD

Axis	COPD (n-64)	
	Number	%
Normal	59	92.2
Right axis deviation (RAD)	05	7.8
Left axis deviation (LAD)	00	00
Total	**64**	**100**

Table V: P-wave changes in ECG among the cases of COPD

P-wave changes	COPD (n-64)	
	Number	%
Normal	42	65.6
Pulmonale	22	34.4
Biphasic	00	00
Multiform	00	00
Total	**64**	**100**

Table V shows 22(34.4%) cases of COPD had P-pulmonale (amplitude of p wave > 2.5 mm).

Table-VI: QRS amplitude changes in ECG among the cases of COPD

QRS complex	COPD (n-64)	
	Number	%
Normal	42	65.6
RVH*	22	34.4
LVH**	00	00
BVH***	00	00
Total	**64**	**100**

Table VI shows that, out of 64 cases of COPD, 42(65.6%) were normal QRS amplitude and 22(34.4%) showed RVH.

*RVH (Right Ventricular Hypertrophy): Tall R wave in V_1>7mm (also deep S in V_5 or V_6).

**LVH (Left Ventricular Hypertrophy): S in V_1 + R in V_6 or V_5>35 mm ($SV_1 + RV_6$>35 mm).

***BVH (Both Ventricular Hypertrophy): Finding of RVH and LVH as described above.

Table VII: Distribution of the cases of COPD with normal and abnormal ECG

ECG	COPD (n-64)	
	No.	%
Normal	42	65.6
Change present	22	34.4
Total	**64**	**100**

Table VII shows 42(65.6%) were normal ECG and 22(34.4%) showed ECG changes out of 64 COPD cases.

DISCUSSION

Chronic obstructive pulmonary disease (COPD) is a major health problem and causes chronic morbidity and mortality throughout the globe including Bangladesh.

According to GOLD[2] (Global Initiative for Chronic Obstructive Lung Disease) in its Global Strategy for diagnosis, management and prevention executive summary, update 2009, the risk of developing COPD is inversely related to socioeconomic status, i.e., COPD occurs more in lower education, occupation and income groups of people in risk. Our study result was consistent with this because our study showed that COPD had occurred more among the farmers with lower socioeconomic status.

According to a study conducted on Burden of Obstructive Lung Diseases in Bangladesh,[1] the main age group involved by COPD was 40-50 years (42.0%). For the age group 51-60 years involvement was 26.6% and for 61-70 years, it was 20-7%. But in our study, it was 29.7%, 28.1%, 42.2% for the age group 40-50 years, 51-60 years and 61-70 years respectively.

The study in India[6] showed peaked p-wave in 35.7%, QRS axis deviation 14.3% patients and normal QRS complex in 85% of their cases.

In our study, 7.8% COPD cases were right axis deviation (RAD) but no left axis deviation (LAD), 34.4% were having peaked p-wave and 65.6% were normal QRS complex and 34.4% cases were right ventricular hypertrophy (RVH).

The study in VSS Medical College[7] showed in their study that right ventricular dilatation was 60% in COPD cases. In our study, 34.4% showed right ventricular dilatation in COPD cases. In our study, 42 (65.6%) showed normal ECG and 22(34.4%) showed ECG changes.

CONCLUSION

In this study, ECG changes were 34.4% in COPD patients. So, while treating COPD patients, physician should be aware of the cardiac condition also.

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Conflict of Interest: None

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