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Research Article

A CROSS SECTIONAL STUDY ON THE CHANGING FREQUENCY OF ECG IN COPD PATIENTS AND ITS SEVERITY

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Abstract:

Objective: The aim of this study was to find the ECG abnormalities frequency in COPD patients in terms of severity of the disease.

Material and Methods: The design of this Study Design Cross-Sectional Study. The duration of this study was from January 2020 to September 2020 and this study was conducted in Allied / DHQ hospital Faisalabad. Patients reporting to medicine in-patient and outdoor patient department were diagnosed for COPD and made a part of the research excluding those having any cardiac comorbidity, long term therapy of oxygen and diuretics. Research sample population was 343 patients. FEV1 and FVC was determined through spirometry for the grading and classification of COPD severity. ECG abnormalities were found through twelve lead standard ECG apparatus.

Results: Mild and moderate COPD was observed in respectively 77 (22.5%) and 121 (35.3%) patients. Severe and very severe pain was observed in respectively 100 (29.2%) and 45 (13.1%) patients. Repeated ECG abnormality was the enlargement of the right atrial in 6 patients (7.8%) mild COPD patients, 27 moderate (22.3%), 48 severe (48%) and 24 very severe (53.3%) patients. The incidence of Right ventricular hypertrophy (RVH) was observed in 1 mild (1.3%), 7 moderate (5.8%), 19 severe (19%) and 12 very severe (26.7%) patients. The presentation of Sinus tachycardia was observed in 6 mild (7.8%), 17 moderate (14%), 19 severe (19%) and 10 very severe (22.2%) patients. Right bundle branch block incidence was observed in 5 mild (6.5%), 9 moderate (7.4%), 13 severe (13%) and 9 very severe (20%) patients. The incidence of SVT was observed in 1 mild (1.3%), 6 moderate (5%), 10 severe (10%) and 8 very severe (17%) patients. Low voltage ECG was observed in 3 mild (3.9%), 7 moderate (5.8%), 12 severe (12%) and 6 very severe (13.3%) patients. Atrial premature contractions (APCs) were observed in 3 mild (3.9%), 11 moderate (9.1%), 14 severe (14%) and 6 very severe (13.3%) patients. Normal ECG incidence was observed in 54 mild (70.1%), 52 moderate (43%), 14 severe (14%) and 3 very severe (6.7%) patients.

Conclusion: In the results of this study multiple complexities in the ECG of COPD patients, which increased as the COPD severity increased. It is therefore recommended that routine of ECG should be continued by the COPD patients.

Keywords: Ventricular, Severity, Moderate, Abnormalities, Spirometry.

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INTRODUCTION:

In the last twenty years COPD is increased as a prominent healthcare issue, in the international perspective causing global death rate as 3 million died because of this disease every year in the world. The incidence of death will rise up to 50% in the next fifteen years. There is an association of COPD with arrhythmias in the stable patients and also with an acute exacerbation [1]. A comparison was carried out in the retrospective cohort research back in 2006 to compare the incidence with and without COPD cases. Outcomes reflect an increased hospital admission and rate of mortality because of COPD that results from angina, acute myocardial infarction, arrhythmias, stroke, pulmonary embolism and congestive heart failure. Cardiac abnormalities are also attributed to COPD such as pulmonary hypertension and right ventricular dysfunction; another repeated and fatal disease is arrhythmias [2].

CVD abnormalities are often noticed in the COPD patients which assist in the identification of increased mortality rate. ECG abnormalities such as right / left ventricular hypertrophy and supraventricular ectopic beats including digoxin therapy are self-determining markers of COPD patient's CVD complications. This research determines the ECG parameter frequencies identified in the COPD cases in the sequence of severity. These parameters predict CVD complications and also point out bad prognosis. An in-time treatment and diagnosis of these abnormalities is helpful for the patients.

MATERIAL AND METHODS:

The duration of this study was from January 2020 to September 2020 and this study was conducted in Allied / DHQ hospital Faisalabad. Patients reporting to medicine in-patient and outdoor patient department were diagnosed for COPD and made a part of the research excluding those having any cardiac comorbidity, long term therapy of oxygen and diuretics. Research sample population was 343 patients. FEV1 and FVC was determined through spirometry for the grading and classification of COPD severity. ECG abnormalities were found through twelve lead standard ECG apparatus [3]. Research found no diabetes history, coronary artery disease, hypertension, valvular heart disease and cardiomyopathy. WHO recognized sample calculator was used for the selection of research sample

including confidence interval, population precision and absolute precision respectively 95%, 4% and 2.3%. Through non-probability sampling technique 343 cases were enrolled in the research. The FEV1 / FVC was observed as <0.7 in all the patients. Patients with FEV1 above 80% were considered as mild cases of COPD and FEV1 in the range of 50 – 80 % moderate, 30 – 50 % as severe and below 30% were taken as very severe COPD patients [4].

Findings of the ECG were observed as: Right Atrial Enlargement (RAE): increased p-wave amplitude above 2.5 mm or upright in lead V-1 having amplitude above 1.5 mm. Right Ventricular Hypertrophy (RVH): Tall R-wave in V-1 and deep S-wave in V-6; whereas, R wave above or equal to S. Supraventricular Tachycardia (SVT): Narrow complex tachycardia having regular interval of RR and p-waves absence. Low Voltage ECG: Complex QRS Amplitude in every 3-standard limb leads (I, II & III) is below 5 mm. Premature Atrial Contraction (PAC): Variable morphology of p-wave and RR short interval. Right Bundle Branch Block (RBBB): Broad QRS more than 120 MSR pattern in V-1 and QRS in V-6. Sinus Tachycardia: Normal sinus rhythm but heart rate more than hundred beats/minute. Normal ECG: Normal rhythm of the sinus & heart rate in the range of 60 – 100 beats/minute. SPSS-17 was used for the data analysis, mean and SD were also calculated for every patient's age. An analysis and frequency were made about the gender. ECG results and spirometry outcomes for every patient. Chi-Square Test was used for the analysis of the frequency for ECG abnormalities and p-value was significant as (< 0.05).

RESULTS:

In the total sample of 343, 234 males (68.2%) and 109 females (31.8%) patients were included with a mean age of 56.6 years (mild COPD), 64.03 years (moderate COPD), 68.27 years (severe COPD) and 75.56 years (very severe COPD). Severity grade wise distribution was observed as 77 mild (22.4%), 121 moderate (35.3%), 100 severe (29.2%) and 45 very severe (13.1%) COPD cases as shown in Table-I. Numerous outcomes of ECG were analyzed in our research such as: RAE, RBBB, RVH and SVT observed frequently in the patients having very severe COPD. Mild COPD cases presented a mild incidence of COPD as shown in Table-II.

Table-I: Demographic Characteristics of The Population Group

Variables	COPD grade							
	Mild (77)		Moderate (121)		Severe (100)		Very Severe (45)	
	N	%	N	%	N	%	N	%
Males (284)	62	27	81	35	58	25	33	14
Females (109)	15	14	40	37	42	39	12	11
Total	77	23	121	35	100	29	45	13
Age (mean) years \pm S.D	57 \pm 11		64 \pm 10		68 \pm 8		76 \pm 10	

Table-II: Frequency of ECG Findings in Patients of COPD According to Severity Of COPD

ECG findings		COPD grade					Total	Sig
		MILD-77	Moderate-121	Severe 100)	Very Severe (45)			
RAE	Count	6	28	48	24	106	<0.001	
	% within gp of COPD	7.80%	23.10%	48%	53.30%	30.90%		
	% of total	1.70%	8.20%	14%	7%			
RVH	Count	1	7	19	12	39	<0.001	
	% within gp of COPD	1.30%	5.80%	19%	26.70%	11.40%		
	% of total	0.30%	2.00%	5.50%	3.50%			
RBBB	Count	5	9	13	9	36	0.057	
	% within gp of COPD	6.50%	7.40%	13.00%	20%	10.50%		
	% of total	1.50%	2.60%	3.80%	2.60%			
APC	Count	3	11	14	6	34	0.129	
	% within gp of COPD	3.90%	9.10%	14.00%	13.30%	9.90%		
	% of total	0.90%	3.20%	4.10%	1.70%			
SVT	Count	1	6	10	8	25	0.004	
	% within gp of COPD	1.30%	5%	10%	17.80%	7.30%		
	% of total	0.30%	1.70%	2.90%	2.30%			
Low Voltage	Count	3	7	12	6	28	0.096	
ECG	% within gp of COPD	3.90%	5.80%	12.00%	13.30%	8.20%		
Sinus	% of total	0.90%	2.00%	3.50%	1.70%			
Tachycardia	Count	6	17	19	10	52	0.1	
	% within gp of COPD	7.80%	14.00%	19.00%	22.20%	15.20%		
	% of total	1.70%	5.00%	5.50%	2.90%			
Normal ECG	Count	54	52	14	3	123	<0.001	
	% within gp of COPD	70.10%	43.00%	14.00%	6.70%	35.9		
	% of total	15.70%	15.20%	4.10%	0.90%			

DISCUSSION:

CVD association spectrum with COPD is wide and broad that causes the development of the pulmonary hypertension with the passage of time and also increases the mortality rate [5]. Our research severe and very severe COPD cases developed an incidence of the pulmonary hypertension with the variations in ECG that favored core pulmonale frequently [6]. COPD associated pulmonary hypertension causes right ventricular hypertrophy and electrocardiographic core pulmonale is specific [7]. Features of electrocardiogram in COPD patients suggesting pulmonary hypertension are RAE, an incomplete RBBB, low voltage and RVH [8]. Our research assessed all of them and found them frequent in the very severe cases of COPD. Abnormalities of ECG were also common in the very severe cases including RAE, RBBB and RVH [9], marked heart clockwise rotation, leads-III QS pattern, VF, PACs, LAD and SVTs. Right ventricular hypertrophy observation in ECG with the case of lead V-1 points [10] out the right ventricular systolic dysfunction presence. Right ventricular systolic dysfunction can be diagnosed through ECG in pulmonary hypertension patients [11]. According to the outcomes of our research right ventricular hypertrophy was observed in 39 patients (11.4%). RBBB had an association with hemodynamic cardiac failure results with associated left ventricle asynchrony and in some of the cases dilatation of right ventricular. RBBB was prevalent in 36 COPD patients (10.5%). COPD inclines patients to pulmonary hypertension and cardiac arrhythmias. Pulmonary hypertension causes right ventricular strain because of the right atrium stretch which causes arrhythmias in the patients. Another cause of arrhythmias is the metabolic change in the shape of acidosis and hypoxia. Disease progression decision can be made through ECG in COPD patients [12]. Our research found abnormal ECG in 123 patients (35.9%). Peaked p-wave indicated RAE in 105 patients (30.6%). US research studies estimate 89,000 cases every year of supra ventricular tachycardia and 570,000 paroxysmal supraventricular tachycardia individuals. The association of supraventricular tachycardia is made to the long-term oral steroid's intake and long standing antimuscarinics.

Numerous other research studies have discussed limitations of airflow association with atrial fibrillation and an incidence of higher atrial fibrillation in severe airflow obstruction having FEV-1 < 50%. Our outcomes present presence of SVT in 25 COPD patients (7.3%) and in case of very severe COPD 8 patients (17%) presented SVT incidence, sinus tachycardia was observed in 52 patients (15.2%) [13],

atrial premature contractions observed in 34 patients (9.9%). A Korean research (2009) shown relation of chronic AF with limited ventilatory function and also observed the beta blockers effects and beta agonists. In the practice of medicine, β -blockers are not favoring the ventilation, therefore, commonly treated for the reduction of the AF ventricular rate; whereas, beta agonists, that is potent exacerbate of cardiac rhythm and used for the management of limited function of the lung. Research held at Copenhagen heart study states relation of reduced AF and FEV-1 [14]. Healthcare is required more for the COPD patients because of the disease severity and compromised quality of life in comparison to the patients without cardiac disease.

CONCLUSION:

Research observed multiple complexities in the ECG of COPD patients, which increased as the COPD severity increased. It is therefore recommended that routine of ECG should be continued by the COPD patients.

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