

Frequency and Variation of Electrocardiographic Changes Patients of Pulmonary Tuberculosis

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ABSTRACT

Objectives: To determine the frequency of various Electrocardiographic (ECG) changes in patients of Pulmonary tuberculosis.

Study Design: Descriptive study.

Place and Duration of study: This study was conducted at the Institute of Chest Diseases Kotri from June 2016 to December 2016.

Material and Methods: During study period 50 patients with pulmonary tuberculosis were included; patients with any other preexisting congenital, valvular, and infective or cardiomyopathy were excluded. After informed consent detailed history, socio-demographic characteristics with clinical presentation were noted. All necessary laboratory investigation and ECG was performed in all cases. Observations were recorded on proforma.

Results: In this study 42 (84%) males and females 08(12%) mostly in age group of 46-60 years i.e. 24(48%). Most of the patients 35(70%) belong to rural areas and lower economic class 43(86%). In 22(44%) patient there was family history of TB and 34(68%) were smokers.

Regarding clinical presentations all the patient present with fever 43(86%), malaise in 31(62%), weight loss in (56%), jaundice 06(12%), productive cough was observed in 45(90%) while in 34(68%) hemoptysis was also there. Majority of patients present with pallor 48(96%), 16(32%) complains chest pain with shortness of breathing in 27(54%) and clubbing in 26(52%).

On laboratory investigations 50 (100%) was showing sputum culture positive for acid fast bacilli (AFB) with comparison of AFB positive in morning sputum in 38 (76%), Hemoglobin levels were found less than 10mg% in 27(54%) in 23(46%) it is above 10mg % . Erythrocyte sedimentation rate (ESR) was <50 in only 02 (04%) rest of the patients 48 (96%) having ESR more than 50 mm after first hour. Total leucocyte count was seen more than 11000 /mm³ in 24 (48%) and in 26 (52%) it is more than 11000/mm³. Pleural effusion in 13 patients was noted and their examination reveals exudate with protein levels more than 3gm/ dl. The patients who had pleural effusion also shows positive coagulium test as well. All patients were found negative for drug resistance on genexpert. (molecular test) Different electrocardiographic changes were observed in 38 (76%) out of 50 cases in TB patients of different varieties. Sinus tachycardia was seen in 29(58%), P wave changes in 11(22%), P pulmonale in 12 (24%), Low voltage QRS in 19(38%), Left axis deviation in 11(22%) and Right axis deviation 10 in (20%).

Conclusion: As cardiopulmonary functions are correlated with one another abnormal changes in one system is reflected on other as well. Out of 50 patients of TB 38 had changes in cardiac functions reflected in ECG. Therefore it is important to diagnose and treat TB as prompt measure for prevention of cardiac complication seen in diagnosed and even in new pulmonary tuberculosis cases.

Key Words: ECG, sputum positive, tuberculosis

Citation of article: Ghouri A, Ahmed A, Bhatti KA. Frequency and Variation of Electrocardiographic Changes Patients of Pulmonary Tuberculosis. Med Forum 2017;28(2):27-30.

INTRODUCTION

Tuberculosis (TB) is one of the oldest infectious diseases which remain a major cause of morbidity and mortality in developing countries like us.

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Received: January 2, 2017; Accepted: February 11, 2017

Regardless of changing trends in life style, socioeconomic development and advances in medical science TB is still the second most common cause of death. Pakistan ranks fifth amongst countries with highest burden of TB globally. The incidence of TB being 231/100,000 and about 420,000 new cases annually reported in estimated population of around 180 million.^{1, 2}

Functionally lungs and heart works in such a harmony that alteration in one cause changes in the other. Many respiratory diseases cause changes in the heart also. In about 1-2% of pulmonary tuberculosis patient associated cardiovascular disease are seen. Pericardium is usually affected in rare cases myocardium and valves may be involved.^{3, 4}

Several studies show that the tuberculosis increases the risk of the unstable angina, acute myocardial infarction and chronic heart disease about 40% compared to the non-tuberculosis group. The possible mechanism of heart involvement is direct effect on myocardium and coronary arteries, increased expression of pro-inflammatory cytokines like interleukins.^{5,6}

As only few studies available in our setup on cardiac manifestations due to TB, so this study is designed to have insight in increasing incidence of pulmonary tuberculosis cases particularly in a developing country like Pakistan. Early evaluation of cardiac manifestation by ECG provides timely management with proper treatment and prevention of various complications associated with tuberculosis.

MATERIALS AND METHODS

This descriptive study was conducted from June 2016 to December 2016 in Institute of chest diseases at Kotri district Jamshoro after approval of institutional Ethics Committee. All the patients with tuberculosis were included in the study while patients with any other preexisting congenital, valvular, and infective or cardiomyopathy were excluded. After informed consent detailed history, socio-demographic characteristics like age, sex, socioeconomic status (SES), education, residence, marital status, smoking habits and weight was noted and recorded on proforma designed for this study.

Clinical examination with important laboratory investigations were performed and recorded on proforma. Then in all patients heart changes were evaluated by ECG after all necessary precautions. A 12 lead ECG including 3 bipolar limb leads (I, II and III), 3 augmented (aVR, aVL and aVF) unipolar limb leads and 6 unipolar precordial leads was performed. Various ECG parameters like rate, rhythm, axis deviation, P-wave changes, QRS complex, T-wave, ST changes were observed.

RESULTS

During study period 50 patients were enrolled in study out of which 42 (84%) males and females 08(12%) between age group 15-30 years 15(30%), 31-45 years 11(22%) and in age group of 46-60 include 24(48%). Out of these 43 (86%) are married while 07(14%) are unmarried with primary education in 16(32%), secondary education in 29(58%) and only 05(10%) were graduate. Most of the patients 35(70%) belong to rural areas while 15(30%) from urban areas. In 22(44%) patient there was family history of TB while 28(56%) had not any history of TB. Smoking habits was observed in 34(68%) while in 16(32%) never smoked. Majority of patients belonged to lower economic class 43(86%) while 07(14%) belongs to middle class also. Regarding weight of patients 48(96%) had weight more 45 Kg and 02(06%) had

weight less than 45 Kg. In 47(94%) duration of disease is less than one month while 03(06%) patients had duration of more than one month shown in table 1.

Table No.1: Demographic of TB patients n=50

Age in years	15-30	31-45	46-60
	15(30%)	24(48%)	11(22%)
Gender	Male	Females	
	42(84%)	08(10%)	
Marital status	Married	Unmarried	
	43(86%)	07(09%)	
Education	Primary	Secondary	Graduation
	16(32%)	29(58%)	05(10%)
Residence	Rural	Urban	
	35(70%)	15(30%)	
Family history of TB	Yes	No	
	22(44%)	28(56%)	
Smoking Habit	Yes	No	
	34(68%)	16(32%)	
Socioeconomic status	Upper	Middle	Lower
	00	07(14%)	43(86%)
Body Weight	>45 Kg	<45 Kg	
	48(96%)	02(06%)	
Duration of Disease	>1 month	< 1 month	
	47(94%)	03(06%)	

Table No.2: Clinical presentation of TB patients n=50

Symptoms	Number	%
Fever (Low grade)	43	86
Fever (High grade)	07	14
Malaise	31	62
Weight loss	28	56
Jaundice	06	12
Productive cough	45	90
Hemoptysis	34	68
Pallor	48	96
Chest pain	16	32
Clubbing	26	52
Shortness of breathing	27	54

All the patients present with clinical presentations suggestive of tuberculosis further diagnosed on investigations. All the patient present with fever 43(86%) present with low grade while 07 (14%) with high grade, malaise is seen in 31(62%), weight loss in (56%), jaundice 06(12%), productive cough was observed in 45(90%) while in 34(68%) hemoptysis was also there. Majority of patients present with pallor 48(96%), 16(32%) complains chest pain with shortness of breathing in 27(54%), interestingly clubbing was also noted in 26(52%) cases shown in table 2.

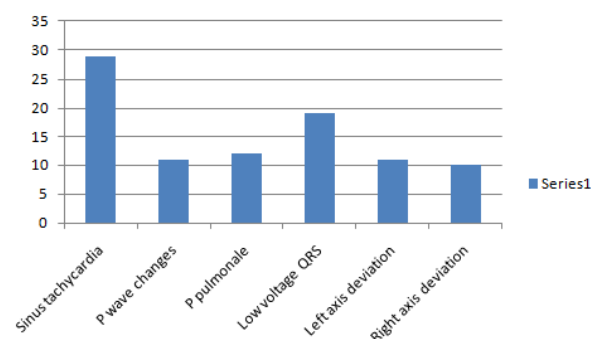
Table No.3 Laboratory investigations of TB patients

	Number	%
Sputum AFB +ve	38	76
Sputum culture +ve	50	100
Hemoglobin < 10	27	54
>10	23	46
ESR <50	02	04
>50	48	96
TLC > 11000	24	48
< 11000	26	52
Pleural effusion with exudate(protein >3gm)	13	26
Coagulum test +ve	13	26
Genexpert (RND)		
Resistance not detected	50	100

Table 3 is showing different laboratory investigations in TB patients. All the patients i.e. 50 (100%) was showing sputum culture positive for acid fast bacilli (AFB) with comparison of AFB positive in morning sputum in 38 (76%), Hemoglobin levels were found less than 10mg% in 27(54%) in 23(46%) it is above 10mg %. Erythrocyte sedimentation rate (ESR) was <50 in only 02 (04%) rest of the patients 48 (96%) having ESR more than 50 mm after first hour. Total leukocyte count was seen more than 11000/ mm³ in 24 (48%) and in 26 (52%) it is more than 11000/mm³. Pleural effusion in 13 patients was noted and their examination reveals exudate with protein levels more than 3gm/dl. The patients who had pleural effusion also shows positive coagulum test as well. All patients were found negative for drug resistance on genexpert.

Table No.4: ECG changes in TB patients

	Number	%
Sinus tachycardia	29	58
P wave changes	11	22
P pulmonale	12	24
Low voltage QRS complex	19	38
Left axis deviation	11	22
Right axis deviation	10	20

**Graph No.1: ECG changes in TB patients.**

Different electrocardiographic changes were observed in 38 (76%) out of 50 cases in TB patients of different varieties. Sinus tachycardia was seen in 29(58%), P

wave changes in 11(22%), P pulmonale in 12 (24%), Low voltage QRS in 19(38%), Left axis deviation in 11(22%) and Right axis deviation 10 in (20%).

DISCUSSION

This study was conducted on 50 patients at institute of chest diseases at Kotri. Diagnosis of TB was confirmed by investigations. None of them had any known heart disease. As tuberculosis is commonly known as disease of poverty, poor hygiene, smoking, overcrowding and malnutrition are other associating factors in causation.

In this study majority of patient 70% belongs to rural areas deprived of necessary facilities of healthy living like clean drinking water, low proteinaceous meal, overcrowded poor ventilated residences and sanitation, 68% were smokers and 86% belongs to lower socio economic class, these findings are more or less similar with the study of Jagdeesh and Metha who found more than half 39 (65.0%) were having rural background, (33.3%) smokers and 60% patient belong to lower socioeconomic status.⁷

Of the 50 patients 08 patients (16%) were females and 42 patients (84%) were males which is unrelated with studies conducted by Akhtar T and Ahmed M who found the ratio of females more than males that is 57% females and 43% males, this difference may be due to change in sample size or study duration.^{8,9}

Productive cough, hemoptysis, weight loss and malaise are common findings of TB patients we observed 90%, 68%, 56% and 62% respectively while study conducted by Khattak in northern Pakistan found these changes 85%, 27%, 50%, 50% respectively, quite similar as both reflecting poorly developed strata of study subjects.¹⁰

Different electrocardiographic changes were observed in 38 (76%) out of 50 cases in TB patients. Changes observed were sinus tachycardia seen in 29(58%), P wave changes in 11(22%), P pulmonale in 12(24%), low voltage QRS in 19(38%), left axis deviation in 11(22%) and right axis deviation 10 in (20%). Study conducted by Manoranjan Dash revealed ECG changes in 64% cases of TB with sinus tachycardia in 54%, P wave changes in 4%, P pulmonale in 4%, low voltage QRS complex in 10%, right axis deviation in 12% other changes in ECG were noted by authors but not observed in our study. ECG changes with some similarities and differences authors like khanna and Gouretal reported ECG changes in TB patients^{11,12,13}

The study conducted by Dasti and Hashmi at Liaquat university hospital showed cardiac involvement in 69.4% which is very near to our study. Pericardial involvement shown by low QRS complex was observed in 06% cases while we observed in 10% while study by Larrieu AJ, et al found it in 08% of the patients with pulmonary tuberculosis and it is consistent with the present study.^{14, 15}

CONCLUSION

As cardiopulmonary functions are correlated with one another abnormal changes in one system is reflected on other as well. Out of 50 patients of TB 38 had changes in cardiac functions reflected in ECG. Therefore it is important to diagnose and treat TB as prompt measure for prevention of cardiac complication seen in even newly diagnosed cases. In present study the sinus tachycardia, P pulmonale and low voltage QRS complexes were significant findings on electrocardiograph, therefore special attention must be paid to patients with atypical features like chest pain, breathlessness. Abnormal ECG changes should be further assessed with echocardiography to detect any cardiac involvement for accurate and timely management.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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