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ECG Abnormalities in Asymptomatic Hospitalized Patients - A Study in Medicine Unit, CMCH

Mohammed Mokter Hossain*[1], Noor Mohammed[1], Mohammad Imam Hossain[1], Mohammed Jahedul Islam[1], Rabiul Alam Md Erfan Uddin[1], Atiquel Islam Chowdhury[2]

[1] Department of Medicine, Chittagong Medical College Hospital, Chittagong
[2] Department of Medicine, Southern Medical College, Chittagong

Abstract: ***Background:*** A six-month prospective survey of ECG abnormalities in asymptomatic patients was carried out in Chittagong Medical College Hospital. In the year 2020, according to an estimation 3100 patients per month were admitted at medicine unit in Chittagong Medical College Hospital with various symptoms, out of them who were present with typical anginal pain were evaluated by electrocardiographic tracing. ***Methodology:*** This study is designed as an observational, prospective research, focusing on the evaluation of clinical patterns over time. Conducted over a six-month period from October 2009 to March 2010, it employs a purposive sampling technique, ensuring that participants are selected based on specific criteria relevant to the study's. ***Results:*** A total of 500 patients were randomly selected from those admitted to the medicine wards of Chittagong Medical College Hospital, presenting with symptoms other than coronary artery disease. Their resting ECGs were recorded and interpreted by a consultant cardiologist. The study revealed that among the study population, 356 were male and 144 were female, with an age range between 18 to 81 years. Out of these, 172 were smokers, 98 had a history of hypertension, 82 were obese, 73 had a family history of coronary artery disease (CAD), and 85 had dyslipidemia. After interpretation of ECGs, it was found that 290 patients (58%) exhibited various ECG abnormalities. Among the patients with typical ischemic ECG changes (ST depression >1mm, T inversion, pathological Q wave), Troponin-I testing was conducted, where only two patients tested positive for enzyme changes and were referred to the cardiology unit for further management. ***Conclusion:*** This study revealed that the majority of asymptomatic patients exhibited different ECG abnormalities, which can provide prognostic information about their future risk of coronary heart disease events.

Keywords: ECG Abnormalities, Asymptomatic Patients, Prognostic Accuracy, Coronary Artery Disease.

Original Research Article

Correspondence:
Dr. Mohammed Mokter Hossain
Assistant Professor,
Department of Medicine,
Chittagong Medical College Hospital,
Chittagong

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Article at a glance:

Study Purpose: *To explore ECG changes in asymptomatic patients and their link to risk factors.*
Key findings: *58% of patients had ECG abnormalities, with risk factors like smoking and hypertension prevalent.*
Newer findings: *ECG can detect silent ischemia in asymptomatic patients, indicating future heart disease risks.*
Abbreviations: *ECG – Electrocardiogram, CAD – Coronary Artery Disease, BMI – Body Mass Index, HbA1c – Hemoglobin A1c, WBC – White Blood Cell count.*

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INTRODUCTION

Ischaemic heart disease is one of the leading causes of death in developed countries. Worldwide, approximately 15 million deaths occur annually due to heart disease, accounting for 45% of total deaths in developed countries and 25% in developing countries. By 2020, it was estimated that ischaemic heart disease would become the major cause of death in all global regions.[1] A similar study reported that the prevalence of common ECG abnormalities in asymptomatic patients ranged

from 1% to 10%. Atherosclerotic coronary artery disease is the primary underlying cause of most ischaemic events, which can lead to myocardial infarction, congestive cardiac failure, cardiac arrhythmia, and sudden cardiac death. Clinically significant coronary artery disease is uncommon in men under 40 and premenopausal women, but the risk increases with advancing age and in the presence of risk factors such as smoking, hypertension, diabetes, high cholesterol, physical inactivity, and a family history of heart disease. The total burden of coronary artery disease is expected to rise significantly due to the increasing elderly population.[2]

Angina is the most common symptom of myocardial ischaemia, often linked to underlying coronary artery disease. However, for many individuals, the first sign of coronary artery disease may be myocardial infarction or sudden death.[3] It is estimated that 1–2 million middle-aged men have asymptomatic but physiologically significant coronary disease, often referred to as silent myocardial ischaemia.[4] Several resting ECG changes (ST depression, T-wave inversion, pathological Q waves, and left-axis deviation) increase the likelihood of coronary atherosclerosis and future coronary events. However, these findings are relatively uncommon in asymptomatic individuals, occurring in only 1–4% of middle-aged men without clinical coronary artery disease.[5, 6] One-third to one-half of patients with angiographically normal coronary arteries exhibit Q wave, T-wave inversion, or ST changes on their resting ECG.7-9 Conversely, a normal ECG does not exclude coronary artery disease. Asymptomatic patients with baseline ECG abnormalities (Q wave, ST-segment depression, T-wave inversion, left ventricular hypertrophy, and ventricular premature beats) have a higher risk of future coronary events. ECG changes often remain undetected until atherosclerotic plaque progression significantly impairs coronary blood flow. Case-control and cohort studies indicate that asymptomatic individuals with selected ECG findings face an increased risk of myocardial infarction and cardiac death. Screening ECGs have been recommended as a baseline assessment to aid in interpreting changes in subsequent ECGs.[5-7]

OBJECTIVE

General Objective:

To describe ECG abnormalities in patients without typical coronary syndrome presented in tertiary hospital.

Specific Objective:

To describe the pattern of -ECG abnormalities in hospitalized patients without typical coronary symptoms.

To describe the ECG abnormalities about age, sex and risk factors.

To describe the relationship between these silent ECG changes and enzyme changes.

METHODOLOGY

Study Design: This is a descriptive cross-sectional study.

Place of Study: Medicine wards of Chittagong Medical College Hospital.

Period of Study: From October 2019 to March 2020.

Inclusion Criteria

All patients aged over 18 years (both male and female) admitted in medicine wards due to different diseases other than coronary artery disease.

Patients who gave informed consent.

Exclusion Criteria

Patients with typical symptoms of angina or ischemic cardiac pain.

Previously diagnosed case of coronary artery or valvular heart disease.

Diabetic patients.

History of abnormal ETT /CAG within last three years.

Sampling Technique

Patients those who admitted in Medicine unit with symptoms other than coronary artery disease were selected purposively on the basis of defined inclusion criteria than interviewed through a semi structured questionnaire, physical examination was done and data were recorded. Resting ECGs were done in the ward. Troponine-1 were done within 24 hours of doing ECG only in patients with typical ECG Changes.

Data collection: Data were collected by a pre-designed questionnaire and investigations and put into
data collection form.

ECG Interpretation: ECGs were interpreted by a consultant cardiologist.

RESULTS

A total of 500 patients that were admitted in medicine ward of Chittagong medical college hospital and the diagnosis was notified from hospital record form and among them 36 case were Viral fever, Enteric fever (34), Pulmonary TB with pleural effusion(74), Community acquired pneumonia (26), Bronchial asthma (16), Peptic ulcer disease (40), cerebrovascular disease(64), Post TB bronchiectasis (24), Chronic obstructive airway disease(64), Viral hepatitis(20),Chronic liver disease(12), Liver abscess(o8), Acute gastroenreritis (10), Bronchial carcinoma(o8), Carcinoma stomach(o8), Acute abdominal condition(24) and other disease(82), selected purposively depending on inclusion criteria and resting ECG recorded and it was interpreted by a consultant cardiologist. The study revealed that among study population 356 were male and 14-4- were female with age above 18 years, where 172 were smoker, 98 patients had history of hypertension, 82 were obese, 85 were dyslipidemia from history and 73 having family history of coronary artery disease. After interpretation of ECG of study population it has been found that 210 (42%) patients have normal ECG traching and 290 (58%) of the patients having different ECG abnormalities including sinus bradycardia in 28(5.2%) patients, sinus tachycardia in 82(16.4%) patients, incomplete RBBB in 58(11 .6%) patients, poor progression of R wave in 09(1.8%) patients, 05 (01%) with atrial fibrillation, ventricular ectopics in 04(0.8%) patients, left ventricular hypertrophy in 23(4.6%) patients, sinus tachycardia with incomplete RBBB in 19(3.8%) patients, multifocal atrial tachycardia with sinus arrhythmia in 2(0.4%) patients, lateral ischaemia in 10(02%) patients, global ischaemia in 02(0.4%) patients, non-specific ST-T changes in 21(4.2%) patients, anterior ischaemia in 06(1.2%) patients, inferior ischaemia in 10(02%) patients and antero-lateral ischaemia in 11(2.2%) patients. The patients with typical ischaemic changes Troponin-I were done where only 02 patients were found to be positive for enzyme changes which were referred to card (blogy unit for further management. These patients were further reviewed to correlate the findings and identify the related risk factors.

Table 1: Sex Distribution of the Study Population (n=500)

Sex	No of Case	Percentage	Male: Female
Male	356	0.712	
Female	144	0.288	2.47: 1

71.2% population were male and 28.8% were female

Table 2: Age Distribution of the Study Population (n=500)

Age in Years	No of Patients	Percentage
16-25	116	23.20%
26-35	117	23.40%
36-45	71	14.20%
46-55	70	14%
56-65	78	15.60%
66-75	31	6.20%
>75	17	3.40%

Majority of study population (23.4%) is in 26 to 35 age group and 3.4% in above 75 years.

Table 3: Distribution of Risk Factors of Coronary Artery Diseases in the Study Population (n=500)

Risk Factor	No of Patients	Percentage
Smoking	172	34.40%
Hypertension	98	19.60%
Obesity	82	16.40%
Dyslipidemia	85	17%
Family history	73	14.60%

34.4% of the study population were smokers, 19.6% were hypertensive, 16.4% were obese, 17% were dyslipidemia.

Table 4: Distribution of Risk Factors Among Cases Having Abnormal ECG Recording (n=290)

Risk Factor	No of Patients	Percentage
Smoking	94	32.40%
Hypertension	65	22.40%
Obesity	48	16.60%
Dyslipidemia	45	15.51%
Family history	51	17.60%

32.4% of population with abnormal ECG were smoker& 15.51% were dyslipidemia, 22.4% were hypertensive, 17.6% having family history of coronary artery disease.

Table 5: Distribution ECG Abnormalities in the Study Population (n=500)

Types of Changes	Number of Patients	Percentage
Sinus bradycardia	28	5.60%
Sinus tachycardia	82	16.40%
Incomplete RBBB	58	11.60%
Non-specific ST-T changes	21	4.20%
Left ventricular hypertrophy	23	4.60%
Sinus tachycardia with incomplete RBBB	19	3.80%
Poor progression of R	9	1.80%
Ventricular ectopics	4	0.80%
Atrial fibrillation	5	1.00%
Multifocal atrial tachycardia with sinus arrhythmia	2	0.40%
Lateral ischaemia	10	2.00%
Global ischaemia	2	0.40%
Inferior ischaemia	10	2.00%
Anterior ischaemia	6	1.20%
Antero-lateral ischaemia	11	2.20%
Normal finding	210	42.00%

Shows different ECG abnormalities in the study population where 42% having normal ECG tracing. LVH, incomplete RBBB, Poor progression R wave, 4.6%, 11.6%, 1.8%, respectably and ishaemic changes total 8.2%.

DISCUSSION

In this observational study we tried to describe the ECG abnormalities in patients without typical coronary syndrome presented in tertiary hospital as well as to describe this ECG abnormalities in relation to age, sex, risk factors and enzyme changes. Most of the participants were male 71 .2% and 28.8% female belonged to the age above 18 years with majority (53.4%) of ECG abnormalities in patients above 45 years of age. Out of 500 study population 290 patients (58%) were found having abnormal ECG changes among them we found 32.4% were smoker, 22.4% were hypertensive, having family history coronary

artery disease in 17.6%, obesity in 16.6% and dyslipidemia in 15.51% patients. We found that among patients with abnormal ECG changes 53.4% were above age of 45 years which is similar to the study reported by William *et al* (mean age 46±_10).[10] Risk factors were associated with development of future adverse coronary events. In a study AI-Halabi et al found that hypertensive were 23.7%, dyslipidemia in 21.48%, obesity in 18.51% and family history coronary artery disease in 15.55% which is almost similar to our study.33 Smoker were 78.48% which is much higher than that of our study (32.4%) but similar to study report by Cedres *et al* (34%).[11] Some studies showed the prognostic value of ST segment depression, T wave inversion or both on ECG and overall prevalence ranged from 1% to 10% and increased with age.38,42,47,54,57. In our study this ECG abnormality were found in total 8.2% population.

The presence of LVH on ECG however, is strongly associated with adverse coronary heart disease-related events. 4.6% of the population were found to have LVH in our study. There several studies which showed that the prevalence of ECG with LVH abnormalities generally ranged from 1% to 10%.[12-16] The presence of premature ventricular ectopics on ECG also predicts increased risk of future coronary heart disease. In our study it was found that 0.8% of study population have ventricular ectopics. Some studies showed that the similar prevalence ranges from o.8% to 11%.[17-20] Minor or non-specific ECG abnormalities (small changes in the ST segments and T waves, minor Conduction abnormalities) also have been associated with increased cardiovascular morbidity and mortality, and prevalence is 1.2% to 10%.[21-22] In our study it was found that it is 4.2% of the population. In some studies, the prevalence of the most common ECG abnormalities (Q wave, left ventricular hypertrophy, bundle branch block, ST segment depression) ranged from 1% to 10%.35. Abnormal result more common in men and increased with age. Each of the main ECG abnormalities was associated with increases in the risk of coronary artery disease mortality. No summary estimated of the magnitude of increased risk were calculated. The sensitivity of ECG abnormalities for all case mortality was low (32%), but the specificity was relatively high (87%).[23, 24] Although ECG can provide prognostic information about the risk of future coronary heart disease events, the effect of this information on clinical management or disease outcome in asymptomatic patient is unclear.

CONCLUSION

This observational study reveals that majority (58%) of the asymptomatic patients having different ECG abnormalities admitted in the tertiary hospital. ECG abnormalities increase with the increasing age and associated of risk factors like smoking, hypertension, dyslipidemia, obesity and family history of coronary artery disease. So, this study focuses attention on the case finding of asymptomatic coronary artery disease using resting ECGs. Which is further needed to be evaluated to confirm presence of coronary artery disease (e.g. exercise testing, ambulatory ECG or coronary angiography and reviewed for identification of other coronary risk factors and for modification to reduce the morbidity and mortality of future coronary events.

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