Original Article

Electrocardiographic Abnormalities among Suspected Female Patients of Cardiovascular Diseases with Chest Pain

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Abstract

Background: *Cardiovascular disease (CVD) is the leading cause of global mortality for both genders. Electrocardiographic abnormalities play a key role in diagnosing CVD, particularly in patients experiencing chest pain. This study aimed to assess electrocardiographic abnormalities in suspected female patients of cardiovascular diseases with chest pain.* ***Materials and Methods:*** *This prospective observational study was conducted at the Department of Medicine, Eastern Medical College & Hospital, Cumilla, Bangladesh from January 2022 to June 2023. A total of 164 suspected female patients of cardiovascular diseases with chest pain were enrolled in this study as the study subjects. Purposive sampling was applied for sample selection and MS Office tools were used for data analysis.* ***Results:*** *Among the participants, major ECG (electrocardiography) abnormalities included the left bundle branch block (1.2%) and right bundle branch block (1.8%). Sinus bradycardia (12.2%) left anterior fascicular block (4.9%), and incomplete right bundle branch block (3.7%) constituted minor abnormalities. QRS axis deviations were noted in 4.9% and 1.2% of cases for left and right deviations, respectively. Chamber enlargement patterns revealed left ventricular hypertrophy in 3.7% and left atrial enlargement in 4.9% of cases. Brugada pattern and anterior early repolarization were found in 0.6% of cases each. Additionally, ST segment depression (5.5%), T wave inversion (6.7%), and Q wave (1.8%) were observed.* ***Conclusion:*** *In suspected female patients with chest pain and cardiovascular concerns, ECG proves to be an effective tool for detecting major abnormalities such as left and right bundle branch block as well as minor abnormalities like sinus bradycardia, left anterior fascicular block, and incomplete right bundle branch block. ECG serves as a cost-effective and less cumbersome alternative to more advanced diagnostic methods like echocardiography or angiography.*

Keywords: Electrocardiography, Cardiovascular diseases, Chest pain, Female patients.
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Introduction

Currently, primary care cardiovascular (CV) risk management relies on estimating the absolute risk of experiencing a significant CV event in the next decade. Individuals with heightened risk are identified and can undergo treatment involving lifestyle optimization, blood pressure control, and lipid-lowering drugs[1]. The ultimate goal is to reduce risk and prevent disability and death from CV disease. The recent CV disease prevention guidelines from the European Society of Cardiology (ESC) recommend managing individuals with a low (<4%) CV mortality risk based on SCORE but with left ventricular hypertrophy (LVH) on the ECG as intermediate risk (5-9%) for CV events[2]. However, other guidelines, such as the Joint British Societies' guidelines on CV disease prevention[3] and the clinical practice guideline for CV risk management in the Netherlands[4], do not advocate for the routine use of an ECG. Furthermore, ECG findings such as right and left bundle branch blocks (BBB), ST-segment, and/or T-wave abnormalities, as well as second- and third-degree atrioventricular (AV) blocks, consistently predict future cardiovascular (CV) events in the general population[5,6]. Despite the similar magnitude of relative risk to left ventricular hypertrophy (LVH), these ECG abnormalities are not explicitly mentioned in the guidelines. Resting 12-lead electrocardiogram (ECG) abnormalities independently associated with incident coronary heart disease (CHD) and cardiovascular disease (CVD) events[7,8]. Prior studies often focused on men or compared genders without specific age or underlying heart disease criteria for women[7,9]. There is limited data on the prognostic significance of baseline electrocardiogram (ECG) abnormalities in postmenopausal women without clinically manifest heart disease[8]. Additionally, information on the prognostic significance of incident ECG abnormalities is lacking. The Women's Health Initiative (WHI) clinical trials on hormone therapy

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in healthy postmenopausal women aimed to assess whether a combination of estrogen and progestin could reduce CHD and CVD events[10]. However, the study revealed a significant increase in CHD rates among women receiving hormone therapy compared to the placebo group[11]. A subsequent article on CHD risk found that clinical characteristics or biomarkers did not significantly modify the treatment-related risk of CHD endpoints[12]. The objective of this current study was to assess electrocardiographic abnormalities in suspected female patients of cardiovascular diseases with chest pain.

Materials and Methods

This was a prospective observational study that was conducted at the Department of Medicine, Eastern Medical College & Hospital, Cumilla, Bangladesh from January 2022 to June 2023. A total of 164 suspected female patients of cardiovascular diseases with chest pain were enrolled in this study as the study subjects. All participants completed a medical questionnaire, providing information on the use of antihypertensive and anti-hypercholesterolemia medications. Measurements of weight and height were taken, and blood samples were collected for random serum cholesterol measurement. Purposive sampling was employed for sample selection, and written informed consent was obtained from all participants before data collection. Exclusion criteria included a history of prior myocardial infarction (MI), angina, congestive heart failure (CCF), coronary artery bypass graft (CABG) surgery, percutaneous transluminal coronary angioplasty or stenting, permanent pacemakers, stroke or transient ischemic attacks, deep venous thrombosis, and pulmonary embolism. Demographic and clinical information of participants was recorded, and data was processed, analyzed, and disseminated using Microsoft Office tools.

Results

In this study, regarding the age distribution of study subjects, the majority of participants (43%) were in the 46-65 years age group. Additionally, 26%, 18%, and 13% belonged to the 36-45, 18-35, and ≥66 years age groups, respectively. In this study, tachycardia and bradycardia were found in 14% and 5% of cases respectively. In this present study, major ECG abnormalities among participants revealed that left bundle branch block (LBBB) and right bundle branch block (RBBB) were the most common, found in 1.2% and 1.8% of cases, respectively. Additionally, atrial fibrillation (AF) and atrial flutter (AFL) were found in 0.6% of cases each. Minor ECG abnormalities included sinus bradycardia, left anterior fascicular block (LAFB), and incomplete RBBB, with prevalences of 12.2%, 4.9%, and 3.7%, respectively. QRS axis deviations were noted in 4.9% and 1.2% of cases for left and right deviations, respectively. Chamber enlargement patterns showed left ventricular hypertrophy (LVH) in 3.7% and left atrial enlargement (LAE) in 4.9% of cases. Brugada pattern and anterior early repolarization were found in 0.6% of cases each. Additionally, ST segment depression, T wave inversion, and Q wave were observed in 5.5%, 6.7%, and 1.8% of cases, respectively.

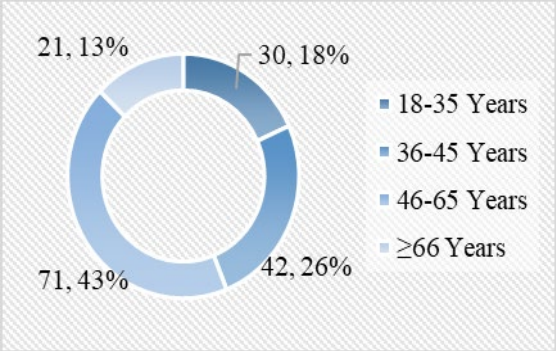

Figure-1: Age distribution of the participants (n=164)

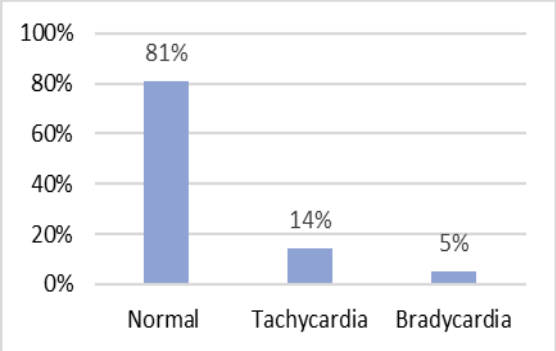

Figure-2: Heart rate of the study subjects (n=164)

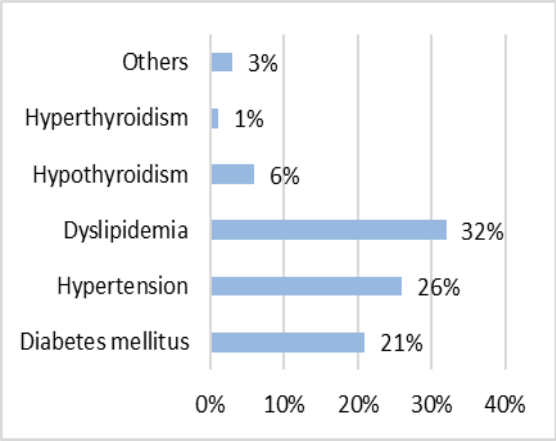

Figure-3: Comorbidities distribution of the study cases (n=164)

Table-I: Electrocardiography (ECG) abnormalities in the study participants (n=164)

ECG pattern	Frequency (n)	Percentage (%)
Major abnormalities		
Atrial fibrillation (AF)	1	0.6%
Atrial flutter (AFL)	1	0.6%
Left bundle branch block (LBBB)	2	1.2%
Right bundle br. block (RBBB)	3	1.8%
Wolf-Parkinson-White (WPW)	1	0.6%
Minor abnormalities		
Sinus bradycardia	20	12.2%
Premature ventricular complex	2	1.2%
Premature atrial complex	2	1.2%
First-degree atrioventricular block	1	0.6%
Incomplete RBBB	6	3.7%
Left anterior fascicular block	8	4.9%
Left posterior fascicular block	1	0.6%
QRS axis deviation		
Left deviation	8	4.9%
Right deviation	2	1.2%
Chamber enlargement patterns		
Left ventricular hypertrophy (LVH)	6	3.7%
Left atrial enlargement (LAE)	8	4.9%
Brugada syndrome and early repolarization		
Brugada syndrome pattern	1	0.6%
Anterior early repolarization	1	0.6%
Myocardial infraction patterns		
ST segment depression	9	5.5%
T wave inversion	11	6.7%
Q wave	3	1.8%

Discussion

This study aimed to assess electrocardiographic abnormalities in suspected female patients of cardiovascular diseases with chest pain. In this research, the age distribution of the study subjects reveals that the largest proportion of participants (43%) falls within the 46-65 years age group. Furthermore, 26%, 18%, and 13% are allocated to the 36-45, 18-35, and ≥66 years age groups, respectively. A separate study demonstrated that 69 (26.80%), 46 (17.80%), 66 (25.60%), and 65 (29.8%) cases belonged to the <45, 46-54, 55-64, and ≥65 years age groups, respectively[13]. These results closely align with the findings of our current study. Increasing age is an independent risk factor for CVD, however. The burden of CVD risk associated with rising age can be reduced partly by the modification of traditional coexisting CVD risk factors[14,15].

Regarding the heart rate of the study subjects, the majority of cases (81%) exhibited a normal heart rate. Tachycardia was observed in 14% of cases, while bradycardia was noted in 5% of cases. Analysis of comorbidities revealed that approximately one-third of the cases (32%) had dyslipidemia, and 21% and 26% had diabetes mellitus and hypertension, respectively. Multiple studies suggest that the high prevalence of significant abnormalities in heart rate may be attributed to the elevated occurrence of hypertension and dyslipidemia as comorbidities, which are recognized as significant contributors to ECG changes[16,17]. In this current study, the analysis of major ECG abnormalities among participants revealed that left bundle branch block (LBBB) and right bundle branch block (RBBB) were the most prevalent, detected in 1.2% and 1.8% of cases, respectively. Atrial fibrillation (AF) and atrial flutter (AFL) were each found in 0.6% of cases. Minor ECG abnormalities included sinus bradycardia, left anterior fascicular block (LAFB), and incomplete RBBB, with frequencies of 12.2%, 4.9%, and 3.7%, respectively. QRS axis deviations were noted in 4.9% and 1.2% of cases for left and right deviations, respectively. Chamber enlargement patterns revealed left ventricular hypertrophy (LVH) in 3.7% and left atrial enlargement (LAE) in 4.9% of cases. Brugada syndrome pattern and anterior early repolarization were found in 0.6% of cases each. Additionally, ST segment depression, T wave inversion and Q wave were observed in 5.5%, 6.7%, and 1.8% of cases, respectively. Similar observations were also observed in another study by Ahmadi, et al[18].

LAE is a frequent finding in patients with preserved systolic function seen in current practice; this abnormality is strongly related to LVH and to diastolic dysfunction[19]. According to the Global Health Data Exchange (GHDx) database, the estimated prevalence of AF in the world population is 0.51%[20]. The findings from this current study could provide valuable insights into future research endeavors in similar domains.

Limitation

This study was limited by its single-center design and relatively small sample size. Furthermore, the short duration of the study raises concerns about the generalizability of the findings.

Conclusion

Electrocardiography (ECG) emerges as a pivotal diagnostic tool for suspected female patients with chest pain and cardiovascular issues. It adeptly identifies major abnormalities such as left and right bundle branch block, alongside detecting minor irregularities like sinus bradycardia, left anterior fascicular block and incomplete right bundle branch block. It is a cost-effective and less burdensome alternative to more sophisticated diagnostic approaches such as echocardiography or angiography. The widespread accessibility and rapid results of ECG make it a valuable frontline diagnostic and early treatment strategy for cardiac anomalies in female patients with chest pain.

Conflict of Interest

The authors declared that they have no conflicts of interest.

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