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Silent Cardiac Irregularities: Prevalence and Patterns of ECG Abnormalities in Bangladeshi Hospitalized Individuals

Dr. Mohammed Mokter Hossain[1*], Dr. Noor Mohammed[2], Dr. Mohammad Imam Hossain[3], Dr. Mohammed Jahedul lslam[3], Dr. Rabiul Alam Md. Erfan Uddin[3], Professor Dr. Md. Atiquel Islam Chowdhury[4]

[1]Assistant Professor (Medicine), Chittagong Medical College Hospital, Chittagong, Bangladesh
[2]Senior Consultant (Medicine), Chittagong Medical College Hospital, Chittagong, Bangladesh
[3]Assistant Professor (Medicine), Chittagong Medical College Hospital, Chittagong, Bangladesh
[4]Professor of Medicine, Southern Medical College, Chittagong, Bangladesh

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***Corresponding author:** Dr. Mohammed Mokter Hossain
Assistant Professor (Medicine), Chittagong Medical College Hospital, Chittagong, Bangladesh

Abstract **Original Research Article**

***Background*:** Electrocardiogram (ECG) abnormalities often remain clinically silent yet carry significant prognostic implications, especially among hospitalized patients with comorbidities. In resource-limited settings like Bangladesh, routine ECG screening is underutilized, potentially overlooking cardiac risk in seemingly stable patients. ***Aim*:** To determine the prevalence and types of silent ECG abnormalities among adult patients admitted to the medicine wards of Chittagong Medical College Hospital. ***Methods*:** A cross-sectional study was conducted from January to December 2024 involving 100 consecutively admitted, clinically stable adult patients (aged ≥18) with no known cardiac history. Standard 12-lead ECGs were performed within 24 hours of admission and interpreted independently by two senior physicians using Minnesota Code criteria. Abnormalities were categorized into conduction defects, arrhythmias, ischemic changes, and repolarization abnormalities. ***Results*:** Out of 100 participants, 57% showed one or more ECG abnormalities. The most prevalent were non-specific ST-T changes (21%), followed by left ventricular hypertrophy (13%), atrial fibrillation (10%), and first-degree AV block (7%). A higher frequency of abnormalities was observed in patients over 60 years and those with hypertension or diabetes. Notably, 42% of abnormalities were not linked to any presenting complaint or diagnosis. ***Conclusion*:** Silent ECG abnormalities are common in hospitalized patients without known cardiac disease in Bangladesh. Routine ECG screening can play a vital role in early detection of latent cardiovascular conditions. These findings emphasize the importance of incorporating ECG evaluation as a standard part of initial assessment, particularly for elderly and comorbid patients.

Keywords: Silent ECG abnormalities, Hospitalized patients, Prevalence, Bangladesh, Routine ECG screening.

INTRODUCTION

Cardiovascular diseases (CVDs) remain the leading cause of mortality and morbidity worldwide, contributing to over 17 million deaths annually [1]. Electrocardiography (ECG) remains a cornerstone diagnostic tool in the identification of arrhythmias, ischemic heart disease, conduction abnormalities, and structural heart changes [2]. However, many ECG abnormalities, particularly in hospitalized patients, often remain clinically silent, especially when masked by non-cardiac complaints [3]. In such instances, subtle changes on ECG can be overlooked, resulting in missed opportunities for early intervention.

In low- and middle-income countries like Bangladesh, the burden of undiagnosed cardiovascular pathology is disproportionately high due to limitations in health literacy, delayed health-seeking behavior, and inadequate cardiac screening infrastructure [4]. Hospitalized individuals, often admitted for non-cardiac conditions, may harbor silent cardiac irregularities that are not detected without routine ECG screening [5]. Early identification of such abnormalities is crucial in preventing adverse cardiac events, particularly in elderly or comorbid patients [6].

Previous studies in South Asia and other low-resource settings have shown a high prevalence of incidental ECG findings in hospital patients with no known cardiac history [7]. However, local data on this topic are limited in the Bangladeshi context, and few studies have systematically assessed the burden and pattern of ECG abnormalities among hospitalized individuals without overt cardiac symptoms [8]. This

knowledge gap necessitates focused investigation to inform clinical decision-making and improve hospital-based screening strategies.

The current study aims to evaluate the prevalence and spectrum of ECG abnormalities among clinically stable adult patients admitted to the medicine wards of Chittagong Medical College Hospital.

Objective

The primary objective of this study was to assess the prevalence and characterize the types of electrocardiographic (ECG) abnormalities in clinically stable adult patients admitted to the medicine wards of Chittagong Medical College Hospital, with no prior history of diagnosed cardiac disease.

METHODOLOGY

Study Design and Setting

This was a hospital-based cross-sectional observational study conducted in the medicine wards of Chittagong Medical College Hospital, a tertiary care center in Bangladesh. The study period extended from January 2024 to December 2024.

Study Population

The study included 100 adult inpatients, aged 18 years or older, who were admitted for various medical conditions unrelated to known or previously diagnosed cardiovascular disease. Participants were recruited consecutively based on eligibility criteria.

Inclusion Criteria:

- Adults ≥18 years of age
- Admitted to the medicine ward for non-cardiac illnesses
- Clinically stable at the time of enrollment
- Provided informed consent

Exclusion Criteria:

- History of ischemic heart disease, arrhythmia, or heart failure
- Current use of anti-arrhythmic medications
- Hemodynamically unstable patients
- Incomplete medical records or unreadable ECGs

Data Collection Procedure

After obtaining written informed consent, demographic and clinical data were collected through structured interviews and hospital records. A standard 12-lead ECG was performed within 24 hours of admission for each participant using a calibrated ECG machine. All ECGs were interpreted independently by two experienced internists. Discrepancies in interpretation were resolved by consensus or third expert opinion.

ECG Classification

ECG abnormalities were categorized using the Minnesota Code Manual and grouped as:

- **Conduction abnormalities** (e.g., bundle branch blocks, AV blocks)
- **Arrhythmias** (e.g., atrial fibrillation, premature beats)
- **Ischemic changes** (e.g., ST-segment depression, T-wave inversions)
- **Repolarization abnormalities** (e.g., prolonged QT, ST-T changes)
- **Chamber enlargement patterns** (e.g., left ventricular hypertrophy)

Ethical Considerations

Ethical approval was obtained from the Ethical Review Committee of Chittagong Medical College. Patient confidentiality was maintained throughout, and all participants gave informed consent.

Statistical Analysis

Data were entered and analyzed using SPSS version 25. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. The chi-square test was used to determine associations between ECG abnormalities and demographic or clinical variables. A p-value <0.05 was considered statistically significant.

The prevalence of ECG abnormalities increases progressively with age, peaking at 68.9% in those aged ≥60 years. This trend highlights age as a key risk factor for silent cardiac irregularities.

RESULTS

A total of 100 patients were included in the study. The mean age was 56.3 ± 13.2 years, with a male-to-female ratio of approximately 1.2:1. Among them, 57 individuals (57%) exhibited at least one form of ECG abnormality.

Table 1: Demographic Characteristics of the Study Population

Variable	Frequency (n = 100)	Percentage (%)
Age < 40 years	20	20%
Age 40–59 years	35	35%
Age ≥ 60 years	45	45%
Male	55	55%
Female	45	45%
Known Hypertension	38	38%
Known Diabetes Mellitus	32	32%

The study population had a slight male predominance (55%), with the majority aged ≥60 years (45%). Hypertension and diabetes mellitus were common comorbidities, affecting 38% and 32% of patients, respectively. These characteristics reflect a high-risk internal medicine ward population.

Table 2: Prevalence of ECG Abnormalities

Type of ECG Abnormality	Frequency (n)	Percentage (%)
Non-specific ST-T changes	21	21%
Left ventricular hypertrophy (LVH)	13	13%
Atrial fibrillation (AF)	10	10%
First-degree AV block	7	7%
Others (e.g., PVCs, BBBs)	6	6%

Non-specific ST-T changes were the most common ECG abnormality (21%), followed by LVH (13%) and atrial fibrillation (10%). These findings suggest a significant burden of latent cardiovascular changes among non-cardiac hospitalized patients.

Table 3: ECG Abnormalities According to Age Group

Age Group (years)	Patients with Abnormal ECGs (n)	Percentage (%)
< 40	8	40%
40–59	18	51.4%
≥ 60	31	68.9%

The prevalence of abnormal ECGs increases with age, with nearly 69% of patients aged 60 and above showing abnormalities compared to 40% in patients under 40.

Table 4: Association of Comorbidities with ECG Abnormalities

Comorbidity	Total Patients (n)	Abnormal ECGs (n)	Percentage with Abnormal ECG (%)
Hypertension	38	28	73.7%
Diabetes Mellitus	32	21	65.6%
No comorbidities	30	8	26.7%

Patients with hypertension and diabetes had significantly higher rates of ECG abnormalities (73.7% and 65.6%, respectively) than those without comorbidities (26.7%). These findings align with global evidence that chronic diseases are closely linked to subclinical cardiac dysfunction.

DISCUSSION

This study reveals that over half (57%) of clinically stable, non-cardiac patients admitted to a tertiary hospital in Bangladesh had at least one abnormality on their resting ECG. These findings underscore the significant prevalence of silent cardiac irregularities in hospitalized individuals, particularly in the elderly and those with chronic diseases such as hypertension and diabetes mellitus.

The most frequent ECG abnormality observed was non-specific ST-T changes (21%), which often indicate underlying myocardial ischemia or electrolyte disturbances, even in the absence of chest pain or overt cardiac disease. Similar patterns have been documented in other South Asian populations, where subclinical atherosclerotic burden and delayed diagnosis are common [9, 10]. Left ventricular hypertrophy (13%) and atrial fibrillation (10%) were the next most common findings, both of which are associated with increased cardiovascular morbidity and mortality [11, 12].

The association between increasing age and ECG abnormalities was notable in this study. Nearly 69% of patients aged 60 or older exhibited abnormal ECG findings, a trend consistent with age-related structural and electrical remodeling of the heart [13]. Additionally, patients with hypertension (73.7%) and diabetes mellitus (65.6%) were disproportionately represented among those with ECG abnormalities. This supports existing literature that emphasizes the cardiovascular risks in these populations, even in the absence of overt symptoms [14, 15].

Interestingly, a substantial number of abnormalities, particularly arrhythmias and conduction blocks, were clinically silent and not linked to the reason for hospital admission. These findings echo previous studies that highlight the diagnostic value of routine ECG screening in general medical patients [16, 17]. In resource-constrained settings like Bangladesh, where cardiac investigations beyond ECG may not be readily accessible, the low-cost and high-yield nature of ECG becomes even more critical [18-20].

A strength of this study is its real-world applicability, as it was conducted in a high-volume

public tertiary hospital. However, limitations include the relatively small sample size, single-center design, and lack of long-term follow-up to determine outcomes associated with the detected abnormalities. Future research should consider longitudinal studies to evaluate the prognostic significance of these silent abnormalities in similar populations.

Despite these limitations, the results strongly support incorporating routine ECG evaluation into the initial assessment of hospitalized adults, especially those with risk factors for cardiovascular disease. Early identification of latent conditions can guide further diagnostic workup and potentially alter patient management.

CONCLUSION

This study highlights a high prevalence of silent ECG abnormalities among hospitalized, clinically stable adult patients in Bangladesh. Non-specific ST-T changes, left ventricular hypertrophy, and atrial fibrillation were the most commonly observed patterns. These abnormalities were significantly more common among older individuals and those with comorbidities like hypertension and diabetes mellitus. Importantly, many of these findings were not clinically suspected and were detected only through routine ECG screening. The results underscore the diagnostic importance of ECG as a low-cost, high-value screening tool in general medical wards, especially in resource-limited settings. Routine ECG assessment should be considered a part of standard admission protocols, particularly for elderly and high-risk patients, to facilitate early detection and intervention for latent cardiac conditions. Future research should aim to explore the long-term prognostic implications of these silent ECG abnormalities and evaluate the cost-effectiveness of systematic ECG screening in low- and middle-income countries like Bangladesh.

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