

FREQUENCY OF EARLY REPOLARIZATION DETECTED IN EMERGENCY USING ELECTROCARDIOGRAPHY IN INDIVIDUALS WITHOUT CARDIAC HISTORY

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ABSTRACT

Objective: The early repolarization is the abnormality identified as elevation of junction between QRS complex and the ST segment in 2 consecutive leads on the electrocardiogram. Early repolarization frequency differed greatly between populations. But no evidence exists in the literature regarding the extent of the frequency of early repolarization on electrocardiography in non-cardiac individuals. Therefore, we planned this study. To determine the frequency of early repolarization on electrocardiography in non-cardiac individuals.

Method: Cross-Sectional Study, Punjab Institute of Cardiology, Lahore, About 6 months, i.e., 01st July 2023 to 31st December 2023. Non-cardiac individuals of age 25-65 years, both genders, were included in the study and underwent electrocardiography. Findings were recorded; early repolarization was noted. All this information was recorded in pro forma while analyzed in SPSS version 25. Early repolarization was presented as frequency and percentage.

Results: The mean age of individuals was 42.31 ± 12.58 years. There were 73 (69.5%) male individuals while 32 (30.5%) female individuals. Out of 105 individuals, 8 (7.6%) had early repolarization on electrocardiography while 97 (92.4%) individuals did not have early repolarization on electrocardiography.

Practical Implication: Early repolarization on electrocardiography (ECG) is uncommon in this population, with only 7.6% of individuals exhibiting this pattern. Clinicians should be aware of this, as it may not be a routine finding in similar populations, aiding in informed decision-making about cardiac evaluation or management.

Conclusion: It has been concluded that frequency of early repolarization is very low in non-cardiac individuals.

Keywords: early repolarization, non-cardiac individuals, electrocardiography, ST segment

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INTRODUCTION

Long thought to be a benign condition, the early repolarization pattern was first identified as an elevation of the ST segment of the I leads on the 12-lead electrocardiogram. In more recent investigations, early repolarization has been defined using more complicated or heterogeneous criteria, such as elevation in J-wave and notching or slurring of QRS complex, with or without concurrent ST-segment elevation. Among survivors of cardiac arrest or ventricular fibrillation, an early repolarization pattern has been linked to an increased prevalence, according to other research.¹

Since its initial description in 1936, early repolarization on the ECG has been regarded as a benign ECG finding. Hassager et al., however, disproved this theory in 2008 by showing a link between early

repolarization and a higher incidence of idiopathic ventricular fibrillation. It is crucial to first comprehend the conceptual ambiguity that has developed around the phrase early repolarization in order to reconcile these seemingly incompatible viewpoints and to better comprehend the possible implications of early repolarization in athletes.² Early repolarization syndrome can occur in anywhere between 1% and 13% of the general population, with incidences being higher in more recent research, populations of athletes, and populations of adolescents. Early repolarization has been linked to positive outcomes for a very long time.³

According to another study, the prevalence of the early repolarization pattern in the general population ranges from 5–15%; the broad range is due to varying definitions and the changing nature of the early

repolarization pattern with time.⁴ Another study found that the trend of the rate of early repolarization varies by age, gender, and the parameters employed to measure J-point uplift from baseline, falling between 2 and 24%. (0.05 mV versus 1 mV).⁵ A therapeutic concern continues to be the discrepancy between regularly seen early repolarization patterns in the general population and the low occurrences of sudden cardiac fatalities linked to early repolarization syndrome but fatal, serious repercussions in affected patients. A clinical need still exists for more accurate methods of risk assessment and identification of the small percentage of patients who will actually have incidents.³ One study reported that out of 3,028 enrolled patients, 7.2% had early repolarization.⁶

The rationale of this study is to determine the frequency of early repolarization on electrocardiography in non-cardiac individuals. Literature showed that the frequency of early repolarization varied widely in different populations. But no evidence exists in the literature regarding the extent of early repolarization in the Pakistani general population. Therefore, we have planned to conduct this study to get evidence for local settings and implement screening and diagnosing protocols on the basis of the findings of this study in local settings. This will help us to get updated evidence, and in the future, we will implement the findings of this study for the local population.

MATERIAL AND METHODS

Cross-Sectional Study, Punjab Institute of Cardiology, Lahore, About 6 months, i.e., 1st July 2023 to 31st December 2023. By using the WHO calculator, a sample size of 105 cases is calculated with a 95% confidence level, a 5% margin of error, and a percentage of early repolarization, i.e., 7.2% in non-cardiac individuals. Non-probability, consecutive method. Non-cardiac individuals of age 25-65 years, both genders, attending emergency or outpatient departments with cardiac patients were included in the study. Individuals with congenital or coronary heart disease, chronic arrhythmias, left and right bundle branch block, chronic heart failure, ejection fraction <40%, chronic obstructive pulmonary disease, hepatic dysfunction, and renal dysfunction were not included. One hundred and thirty individuals who fulfilled the inclusion criteria were included in the study from the emergency and outpatient departments. Informed consent was obtained. Demographics like age, sex, BMI, hypertension, diabetes, smoking, dyslipidemia, and family history of cardiac disease were noted. Then individuals underwent electrocardiography by a researcher, and the report was evaluated by consultant cardiologists having at least 4 years' experience. Findings were recorded, and if at least 0.1 mV elevation of the J point or ST segment, with notching or slurring in at least 2 inferior (II, III, & aVF) and/or lateral leads (I, aVL, & V4-6), then early repolarization was labeled. Individuals with early repolarization were treated as per guidelines. All this data

was noted in pro forma. All the collected data was entered and analyzed into SPSS version 25. Early repolarization was presented as frequency and percentage.

RESULTS

In this study, the mean age of individuals was 42.31 ± 12.58 years. There were 73 (69.5%) male individuals and 32 (30.5%) female individuals. The male-to-female ratio observed in this study was 2.3: 1. Out of 105 individuals, 74 (70.5%) individuals had a history of diabetes mellitus, 91 (86.7%) individuals had dyslipidemia, 63 (60.0%) individuals were smokers, 47 (44.8%) individuals had anemia, 98 (93.3%) individuals were hypertensive, and 49 (46.7%) individuals had family history of cardiac disease. Table 1

Out of 105 individuals, 8 (7.6%) had early repolarization on electrocardiography, while 97 (92.4%) individuals did not have early repolarization on electrocardiography.

Table 1: Basic demographics of candidates

	F (%), mean $\pm$ standard deviation
Age (in years)	42.31 $\pm$ 12.58
Gender	
Male	73 (69.5%)
Female	32 (30.5%)
BMI	31.33 $\pm$ 9.96
History of	
Diabetes	74 (70.5%)
Dyslipidemia	91 (86.7%)
Smoking	63 (60.0%)
Anemia	47 (44.8%)
Hypertension	98 (93.3%)
Family history of cardiac disease	49 (46.7%)

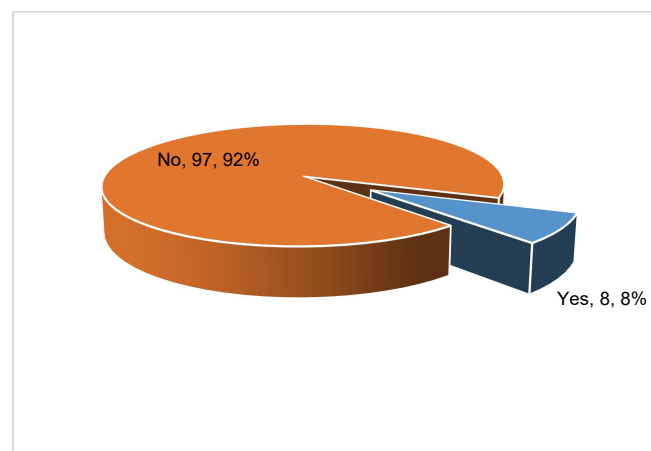


Fig 1: Distribution of Early repolarization

DISCUSSION

J-waves, also known as "early repolarization," or "J-point elevation," is an electrocardiographic anomaly that is associated with an elevated junction between the ST

segment's commencement and the end of the QRS complex in two adjacent leads.⁷ An electrocardiographic phenomenon known as early repolarization is characterized by J-point elevation, ST segment elevation with upper concavity, significant T-waves in at least two adjacent leads, and QRS slurring or notching.⁸

About 1–13% of the population as a whole exhibits an early repolarization trend. For many years, this pattern was linked to a favorable outcome; however, some more previous research has shown a relationship between early repolarization and cardiac mortality, or what is known as early repolarization syndrome.³ In our study, we observed the frequency of early repolarization as 8 (7.6%) in the general population. According to a prior study by Oet al., 219 (7.2%) of the 3,028 patients who were included experienced early repolarization in the preoperative electrocardiogram.⁶ Sportspeople, addicts, cases of hypertrophic obstructive cardiomyopathy, defects, or hypertrophy of cardiac septal defects are common causes of the Early Repolarization Syndrome.⁹⁻¹²

Depending on the population investigated and the techniques employed for electrocardiogram interpretation, the prevalence of early repolarization syndrome in the general population ranges from 3% to 24%. Early repolarization syndrome is more common in certain subpopulations, including young people, particularly those prone to vagotonia, men, African Americans, and athletes.^{8, 13} According to Tikkanen et al., (adjusted relative risk = 2.98; 95%CI: 1.85–4.92; P-value <0.001), both leads (inferior versus lateral) and J-point elevation of > 0.2 mV are associated with major risk of mortality due to cardiac arrhythmias.¹⁴ A person under the age of 45 is thought to experience idiopathic ventricular fibrillation due to early repolarization at 3:100,000 rate.^{15, 16}

In participants with the early repolarization pattern during follow-up, one meta-analysis analyzed the rate of mortality reported of arrhythmia-related, cardiac-related, & all-cause death at 1.68, 4.81, & 17.06 per 1,000 person-years, respectively. Early repolarization was linked to a higher risk of death from an arrhythmia (relative risk: 1.70; 95% confidence interval; 1.19–2.42; p-value = 0.003) but not from cardiac disease (relative risk = 0.78; 95% confidence interval; 0.27–2.21; p-value = 0.63) or from any cause (relative risk = 1.06; 95% confidence interval; 0.85–1.31; p-value = 0.62). The findings also showed that people with the early repolarization pattern had low- to moderate-absolute hazard of arrhythmia-related mortality (70 deaths per 100,000 person-years).¹⁷

The highest relative risk was 3.02 (95% confidence interval; 1.84–4.96; p0.001) when early repolarization in the inferior leads was greater than 2.0 mm. Along with the horizontal / descending ST-segment variation, larger amplitude early repolarization (>0.2 mV) in inferior leads has also been linked to a higher risk of arrhythmic mortality with a hazard ratio = 3.14 (95% confidence interval; 1.56–6.30).¹⁸

Athletes are more likely to experience early repolarization, which has been estimated to occur between 22% and 44% of the time. Competitive athletes have an arrhythmic death probability of about 0.35:100,000.^{15, 18, 19} The absolute hazard risk is still very low, while young, healthy athletes show ST-segment morphology linked to early repolarization that does not seem to be linked to a higher arrhythmic risk.¹⁸ No cardiac incidents or arrhythmias were recorded in the mean 6–4-year follow-up, in a study that examined the clinical implications of early repolarization in 704 sportspersons (rate of early repolarization = 14%).¹²

CONCLUSION

It has been concluded that the frequency of early repolarization is very low in non-cardiac individuals. Now we have the evidence of early repolarization in the local population. Therefore, in the future, we will recommend implementing screening and diagnosing protocols on the basis of the findings of this study in local settings in cardiac as well as non-cardiac individuals to detect it earlier and prevent the individuals from developing cardiac trouble in the coming future.

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