Original Article

Prevalence of J-Wave Syndrome Electrocardiographic Patterns in a Sample of Azerbaijan's General Population

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Abstract

Objective: To this date, there is no information regarding the prevalence of neither the early repolarization syndrome (ERS) nor the Brugada syndrome (BrS) electrocardiographic (ECG) patterns in Azerbaijan. **Study Design and Setting:** This is a retrospective study of ECG recordings obtained between 2011 and 2012 in one clinical center in Baku, Azerbaijan. The recordings were taken during routine check-ups of 1079 males and females of the general population, with an age range between 23 and 78 years (mean age 44 years). The presence of a J-wave in the lateral, inferior/inferolateral, right precordial, or all leads was evaluated by two independent cardiologists. **Results:** The J-wave ECG pattern was present in 66 participants (6.12%). The ERS pattern was present in 63 participants (5.84%), more specifically 1.4% – ERS Type 1, 4.4% – ERS Type 2, and 0% – ERS Type 3. The BrS pattern was present in three participants (0.27%), all of which had a Type 2 pattern. **Conclusion:** The J wave syndrome ECG pattern is not rare in Azerbaijan's general population. The prevalence of both the ERS and the BrS pattern is similar to existing reports from other countries.

Keywords: Brugada syndrome, early repolarization, J-point elevation, J-wave syndromes, sudden cardiac death

Introduction

There is an abundance of scientific material regarding the presence of a J-point elevation on the surface electrocardiogram (ECG). The early repolarization syndrome (ERS) and the Brugada syndrome (BrS) are electrophysiologic entities that are both characterized by prominent or elevated J-waves (among other features) in particular leads of the 12-lead ECG, and although initially considered to be benign variants, nowadays, it is recognized that they do indeed carry malignant potential and are associated with ventricular tachyarrhythmias and sudden cardiac death. The prevalence of these ECG patterns in the Azerbaijan's population is unknown, so we decided to undertake a clinical study to determine that.

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Methods

Study population

We retrospectively examined the ECG recordings of 1079 healthy Azerbaijani participants undergoing annual routine medical examinations between January 2011 and May 2012. Obtaining informed consent was technically not feasible, so we resorted to use the anonymized ECG files for our investigation. The age and gender of the 1079 participants were also provided to us in an anonymous fashion from the staff of the archive department

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that was otherwise not involved in any way in the composition of this report. An ethical approval was not deemed necessary, as our study had suitably anonymized datasets and did not involve any human participants, any identifiable human material, or any identifiable data. Among the participants, there were 68% male and 32% female, aged between 23 and 78 years (mean age 44 years). The analyzed ECGs were 12-lead recordings obtained in the supine position at a paper speed of 25 mm/s and amplitude of 10 mm/mV (ECG Recorder Cardioline ar2100 view, Italy). The ECGs were then evaluated by two experienced cardiologists for the presence of J-wave syndrome patterns, according to the following criteria: (i) for the ERS pattern, a J-point elevation of ≥0.1 mV in at least two of the lateral (ERS Type 1) or inferior/inferolateral (ERS Type 2) or all leads (ERS Type 3, global), as classified by Antzelevitch and Yan in 2010, with QRS slurring or notching and (2) for the BrS pattern, a J-point elevation of ≥0.2 mV with a concomitant coved pattern (Type 1) or saddleback pattern (Type 2) ST-elevation in at least two right precordial leads (V1–V3).[1] The BrS ECG pattern was based on the latest consensus report on the ECG criteria for the diagnosis of the Brugada pattern from 2012 and thus divided BrS pattern into Type 1 and Type 2.[2]

ECG exclusion criteria included any brady- or tachy-arrhythmia at the time of the ECG recording, complete right or left bundle branch block, and signs of previous or current myocardial infarctions in the sense of pathologic Q waves and/or ST-segment elevations in localizations that are typical for infarction.

Statistical analysis

To minimize errors in the evaluation process, ECGs were assessed for interobserver variability using "Cohen's Kappa coefficient." The Kappa value was 0.855 (95% confidence interval: 0.794–0.915; Kappa: 0.8–1.0 = almost perfect). There was high statistical agreement between the observers (agreement: 98.1% [asymptotic standard error: 0.031]). The statistical analysis was performed using the IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, NY, USA)

Results

A J-wave syndrome ECG pattern was present in 66 (6.12%) of 1079 participants. Of the 66 participants with an abnormal ECG, 87% were male and 13% female.

The ERS pattern was observed in 63 (5.84%) and the BrS pattern in 3 (0.27%) of the 1079 participants. The ERS was found in the lateral leads (ERS Type 1) in 15 (1.4%), in the inferior/inferolateral leads (ERS Type 2) in 48 (4.4%), and in all leads (ERS Type 3) in 0 of 1079 participants. The BrS pattern was found in 3 of 1079 subjects, of which all three represented a Type 2 pattern. Typical ECG examples of both ERS and BrS found in the studied population are displayed in Figure 1.

Discussion

The prevalence of the J-wave syndrome ECG patterns in the studied population was found to be 6.12%,which is relatively similar to previous population-based reports.[3,4] We also found a very strong male predominance, with 87% of the J-wave–positive ECG recordings belonging to male participants. We already know that both the ERS and the BrS patterns are far more common in men than in women and the reason for this gender predilection might be the more prominent transient outward potassium (Ito) current in males.[5]

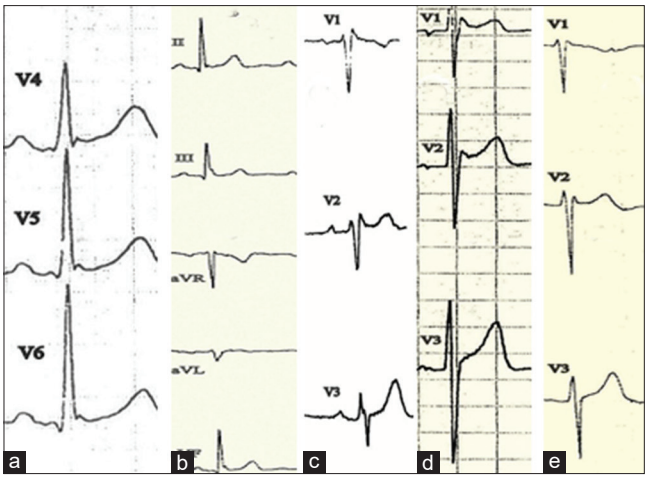

Figure 1: Electrocardiogram samples from the studied population. (a) Electrocardiogram showing early repolarization syndrome Type 1. (b) Electrocardiogram showing early repolarization syndrome Type 2. (c) Electrocardiogram showing Brugada syndrome pattern Type 2. (d) Electrocardiogram showing Brugada syndrome pattern Type 2. (e) Electrocardiogram showing Brugada syndrome-like changes

The reported prevalence of the ERS ECG pattern varies from 1.75% to 13.8%, depending on the characteristics of the studied population (age, gender, ethnicity, etc).[6,7] In certain population collectives, these numbers change dramatically. For example, in Cameroon, the prevalence of the ERS pattern is 20%; among children with attention-deficit hyperactivity disorder, the prevalence of ERS is 32% comparing to 13% in healthy control children; in patients presenting with "idiopathic ventricular fibrillation," it is present in 31%; and in athletes, it is present in about 30%–44%.[8-11]

The BrS ECG pattern, on the other hand, is rarer than the ERS pattern, ranging between 0.012% and 2%.[12,13] However, in particular patient groups, it is seen more frequently, like, for example, at a Heart Rhythm Clinic in Singapore, where the prevalence of the BrS ECG pattern among people who presented with presyncope, syncope, and/or palpitations was found to be a massive 7.1%.[14]

Regarding the prevalence of J-wave ECG patterns as such, Fuyuta *et al*. reported a 2.03% in a hospital in Japan while Kui *et al*. reported a higher prevalence of 7.26% in healthy Chinese participants, which is closer to our own findings in Azerbaijan.[3,6] In the study by Kui *et al*., the most frequent finding was an ERS Type 2 pattern (inferior/inferolateral) with 4.56% followed by an ERS Type 1 pattern (lateral) with

2.2% and the BrS patterns with 0.5%, the results of which are very similar to ours (4.4%, 1.4%, and 0.27%, respectively).[3] Interestingly, Tikkanen *et al*. also found a similar prevalence for the ERS Type 2 and ERS Type 1 patterns in Finland with 3.6%, and 2.4%, respectively.[4]

Such similarities are not all that surprising and might stem from genetic relationships among the Eurasian populations.

Conclusion

Despite the relatively small-sized and single-center methodology, our study is the first to report the prevalence of J-wave syndrome ECG patterns in Azerbaijan, with the findings similar to previously published studies from other countries.

Considering the arrhythmogenic potential and the risk of sudden cardiac death that these syndromes can carry with them, it is important to continue research to better determine the prevalence, better understand the mechanisms, and better estimate the risks associated with them.

Limitations

We recognize that our study has some obvious limitations by design, that there was no follow-up to correlate ECG findings to clinical outcomes, if any, and that there was no documentation of medication available.

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Conflicts of interest

There are no conflicts of interest.

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