Short Communication

Prevalence of cardiac arrhythmias in a hospital-based cohort of police officers in Guayaquil

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Abstract

Cardiac arrhythmias are a relevant cause of morbidity worldwide and are influenced by modifiable cardiovascular risk factors and occupational stress. Police officers face unique psychological and physical stressors, yet data on arrhythmias in this group remain scarce in Latin America. The aim of this study was to review medical records of police officers treated at the National Police Hospital of Guayaquil from January 2017 to December 2022. From 3,334 cardiology consultations, 100 officers with confirmed arrhythmias were identified. Demographic, clinical, and diagnostic data were analyzed using descriptive statistics, non-parametric correlations, and multivariate logistic regression. The proportion of arrhythmias among police officers attending cardiology care was 29.9% (95% confidence interval (CI): 24.8–35.0%), corresponding to 3.0% of all cardiology consultations. Supraventricular tachycardia was the most frequent subtype (27%), followed by atrial fibrillation/flutter (11%). No significant associations were found between arrhythmia type and age, sex, or service status (all $p>0.36$). Logistic regression identified hypertension (OR: 2.3; 95%CI: 1.7–3.1), obesity (OR: 1.8; 95%CI: 1.3–2.5), and occupational stress documented in medical records (OR: 1.6; 95%CI: 1.2–2.1) as independent predictors. This exploratory hospital-based study describes the frequency and distribution of cardiac arrhythmias in Ecuadorian police officers and highlights their association with modifiable risk factors and occupational stress. Given the retrospective single-center design and selective sample, the results should not be generalized to the broader police population. Larger multicenter studies are required to better quantify arrhythmic burden in law enforcement personnel.

Keywords: Cardiac arrhythmia, supraventricular tachycardia, atrial fibrillation, occupational stress, cardiovascular risk factors

Introduction

Cardiac arrhythmias are disorders of the heart's electrical conduction system that may result in bradycardia, tachycardia, or irregular heart rhythms. They are associated with significant morbidity and mortality worldwide, contributing to the overall burden of cardiovascular disease, which accounted for 17.7 million deaths in 2015 [1-6]. While arrhythmias may present with symptoms such as palpitations, dizziness, and syncope, they are often asymptomatic and can lead to complications such as stroke or sudden cardiac death [3,4,7].

Multiple risk factors influence the development of arrhythmias, including hypertension, diabetes, obesity, and stress [6,8,9]. Both sedentary behavior and excessive physical exertion, as well as exposure to occupational stress and high-risk scenarios, have been associated with

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physiological alterations in the myocardium mediated by β1-adrenergic receptor stimulation, which increases heart rate and contractility through the Gs–cAMP–PKA signaling pathway. In parallel, these conditions promote cortisol release and the production of pro-inflammatory cytokines, thereby contributing to oxidative stress, endothelial dysfunction, and ultimately the onset of arrhythmias and cardiovascular disease [1,10-13].

Officers represent a population subject to considerable cardiovascular risk. Their profession entails chronic stress, demanding physical exertion, and irregular schedules—all of which may contribute to the early onset of arrhythmic disorders. Despite these exposures, there is limited research on the prevalence and profile of arrhythmias in police personnel, particularly in Latin America, where additional risk factors such as obesity and physical inactivity are also prevalent [14-20].

The aim of this study was to determine the proportion and characterize the types of cardiac arrhythmias in a cohort of police officers treated at a tertiary care hospital in Guayaquil, which exclusively serves members of the National Police and their families from Guayas province. This population was selected due to the high levels of violence reported in the region and the facilities provided by the hospital's teaching committee. In addition, the study sought to identify the most frequent electrophysiological patterns and clinical factors associated with the development of cardiac rhythm disorders in both active-duty and retired police officers.

Methods

Study design

This retrospective observational study assessed the prevalence and clinical characteristics of cardiac arrhythmias among Ecuadorian police officers treated at the cardiology department of the National Police Hospital of Guayaquil (NPHG) between January 2017 and December 2022. The NPHG is the only specialized healthcare center exclusively serving law enforcement personnel in the Coastal Region of Ecuador, functioning as the primary referral facility for active-duty and retired officers in Guayaquil and neighboring provinces.

Ethical considerations

The study protocol was reviewed and approved by the Directorate of Teaching and Research (Dirección de Docencia) of the NPHG, ensuring compliance with institutional ethical standards. Given the retrospective design and exclusive use of anonymized clinical data, this study was exempt from formal evaluation by an Institutional Ethics Committee (CEISH) in accordance with Ecuadorian national regulations (Ministerial Agreement No. 0004-2019, Art. 42) and international guidelines (Declaration of Helsinki, 2013, §32). Informed consent was waived, as the research involved secondary analysis of pre-existing, de-identified records without direct patient intervention.

Participant screening and selection process

During the study period, patients were evaluated in the Cardiology Department of the National Police Hospital of Guayaquil (NPHG). A structured screening process was used to identify eligible cases, excluding patients with unrelated diagnoses, relatives of police officers, follow-up consultations, and those who did not meet the predefined inclusion criteria (**Table 1**).

Table 1. Eligibility criteria

Inclusion criteria	Exclusion criteria
Active-duty or retired police officer	Arrhythmias diagnosed after confirmed SARS-CoV-2 infection
Confirmed diagnosis of cardiac arrhythmia by a cardiologist	Transient or self-limiting arrhythmic episodes without clinical significance
Comprehensive clinical documentation available for review	Incomplete or inconsistent clinical records, particularly regarding cardiovascular risk factors or diagnostic confirmation
No prior SARS-CoV-2 infection at the time of arrhythmia onset	

Diagnoses were established using electrocardiogram (ECG), Holter monitoring, or electrophysiological studies and subsequently verified through institutional electronic medical records. Given the reduced number of cases after applying strict eligibility criteria, a census sampling approach was implemented to include all available patients who fulfilled the criteria.

This study was conducted retrospectively with an exploratory scope, under the approval of the institutional Teaching and Research Committee. A preliminary literature search in PubMed and HINARI databases yielded no prior studies addressing arrhythmias in active-duty or retired police officers, highlighting the originality and necessity of the present work. Importantly, the reported prevalence does not attempt to overgeneralize beyond the study sample; rather, it reflects the prevalence within the analyzed hospital cohort and is cautiously discussed as a potential indicator of the burden of arrhythmias in this understudied occupational group.

Data collection and analysis

Variables included demographics, cardiovascular history, comorbidities (hypertension, obesity), and diagnostic findings (ECG, Holter, echocardiography). Inconsistent data on smoking/alcohol use were excluded. Occupational stress was qualitatively assessed via physician notes due to a lack of standardized metrics. Statistical analysis were performed using IBM SPSS v26.0 (IBM Corp., NY, USA). Descriptive statistics, non-parametric correlations (Spearman's rho and Kendall's tau-b), and multivariate logistic regression were applied, with a significance level set at $p<0.05$. Police officers without a diagnosis of cardiac arrhythmia, even if presenting cardiovascular risk factors, were not included, as this was not part of the study design nor directly related to the primary objective; therefore, relative risk estimates could not be contextualized within this study.

Biases

Based on the inclusion and exclusion criteria, active and retired officers were selected, while personnel with a history of COVID-19 exposure were excluded. This decision was made because the study aimed to identify sociodemographic factors and elements contributing to the development of cardiac arrhythmias, with emphasis on those most directly related to the professional practice. Since COVID-19 has been associated with the onset of cardiac arrhythmias, the presence of this antecedent could compromise the accuracy of the diagnosis in this population group.

Results

Of the 3,334 cardiology consultations recorded at the National Police hospital of Guayaquil between January 2017 and December 2022, 2,982 were excluded due to diagnoses unrelated to cardiac rhythm disorders, leaving 352 eligible cases. Among these, 45 consultations involving relatives of law enforcement officers were excluded, resulting in 307 patients. Subsequently, 121 follow-up consultations and 86 cases that did not meet the predefined inclusion criteria were further excluded. After applying all eligibility criteria, a total of 100 police officers with confirmed arrhythmias were included in the final analysis (**Figure 1**). These patients, either on active duty or retired, had a confirmed diagnosis of cardiac arrhythmia and met all clinical and diagnostic requirements as defined in the study protocol.

Demographic and clinical characteristics

The study cohort was predominantly male (n=79; 79%), with female officers comprising the remaining 21 participants (21%). Half of the patients were between 25 and 44 years of age (n=50; 50%), while 24% (n=24) were aged 45–64 years, and 26% (n=26) were between 65 and 75 years. In terms of service status, 54% (n=54) were active-duty officers and 46% (n=46) were retired. Baseline clinical characteristics and diagnostic categories are summarized in **Table 2**.

Table 2. Baseline characteristics of the study population

Variable	Frequency	Percentage
Age group (years)		
25–44	50	50.0
45–64	24	24.0
65–75	26	26.0

Variable	Frequency	Percentage
Sex		
Male	79	79.0
Female	21	21.0
Service Status		
Active-duty	54	54.0
Retired	46	46.0
Type of cardiac electrical disorder		
Wolff–parkinson–white syndrome	8	8.0
First-degree atrioventricular block	4	4.0
Supraventricular tachycardia (unspecified)	9	9.0
Sinus bradycardia	5	5.0
Atrial fibrillation and atrial flutter	11	11.0
Supraventricular tachycardia (paroxysmal)	27	27.0
Ventricular tachycardia	5	5.0
Bradycardia (unspecified)	10	10.0
Bifascicular block	1	1.0
Complete atrioventricular block	2	2.0
Second-degree atrioventricular block	1	1.0
Arrhythmogenic right ventricular dysplasia	4	4.0
Acute coronary syndrome with arrhythmia	10	10.0
Sinus tachycardia	2	2.0
Bundle branch re-entrant ventricular tachycardia	1	1.0

Total, n=100

Supraventricular tachycardia was the most frequently observed arrhythmia, present in 27% of the patients. This was followed by atrial fibrillation or atrial flutter (11%), unspecified cardiac arrhythmias (10%), and sinus bradycardia (5%). Other less common conditions included ventricular tachycardia (5%), first-degree atrioventricular block (4%), Wolff–Parkinson–White syndrome (8%), and various forms of bradyarrhythmias and conduction blocks. Full details of arrhythmia distribution is presented in **Table 3**.

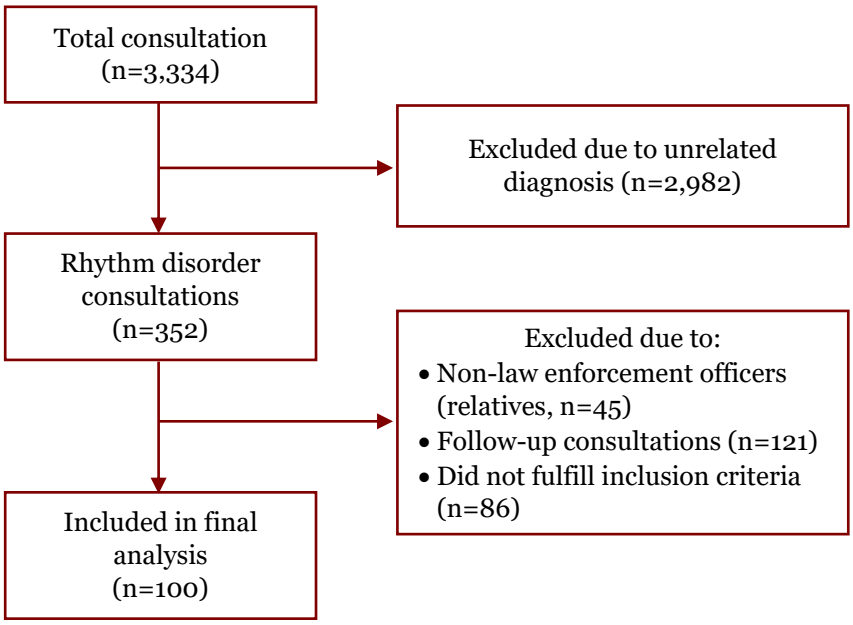

Figure 1. Flowchart of the patient selection and eligibility process among police officers treated at the NPHG cardiology department between 2017 and 2022.

Prevalence and frequency

Based on the total population evaluated in the cardiology service (n=3,334), the overall proportion of clinically confirmed cardiac arrhythmias among the cohort of police officers selected was 29.9% (95% confidence interval (CI): 24.8%–35.0%). Supraventricular tachycardia alone accounted for an estimated proportion of 8.1%, while atrial fibrillation/flutter represented 3.3%. The frequency distribution of all arrhythmia types and their respective prevalence rates are detailed in **Table 3**.

Table 3. Frequency and estimated prevalence of cardiac arrhythmias among police officers

Type of arrhythmia	Frequency	Percentage	Estimated prevalence (% of total cardiology patients, n=3,334)
Unspecified cardiac arrhythmia	10	10.0	0.30
Ventricular re-entrant arrhythmia	4	4.0	0.12
Complete atrioventricular block	2	2.0	0.06
First-degree atrioventricular block	4	4.0	0.12
Second-degree atrioventricular block	1	1.0	0.03
Left bundle branch block (not otherwise specified)	1	1.0	0.03
Left anterior fascicular block	1	1.0	0.03
Sinus bradycardia	5	5.0	0.15
Bradycardia (unspecified)	10	10.0	0.30
Atrial fibrillation and flutter	11	11.0	0.33
Wolff–parkinson–white syndrome	8	8.0	0.24
Sinus tachycardia	2	2.0	0.06
Supraventricular tachycardia	27	27.0	0.81
Ventricular tachycardia	5	5.0	0.15
Tachycardia (unspecified)	9	9.0	0.27
Total	100	100.0	3.00

Estimated prevalence rates were calculated based on the total number of police officers (n=100) diagnosed with arrhythmias among the 3,334 cardiology consultations analyzed.

Correlational analysis

Non-parametric correlation tests (Kendall's tau-b and Spearman's rho) were performed to examine potential associations between demographic variables (sex, age group, and service status) and arrhythmia subtype, in order to assess the degree of influence of these factors on the presentation of the phenomenon.

No statistically significant correlations were observed (all $p>0.36$), indicating that demographic variables alone were not strong predictors of arrhythmia phenotype within this cohort. These results are reported to provide a comprehensive overview of the analyses conducted and should be interpreted with caution, particularly given the limited sample size. The correlation coefficients and their respective *p*-values are presented in **Table 4**.

Table 4. Non-parametric correlations between the type of arrhythmia and demographic variables

Test / variable	Sex	Age group	Service status
Kendall's tau-b			
Correlation coefficient	−0.030	0.040	−0.078
p-value	0.732	0.629	0.366
Spearman's rho			
Correlation coefficient	−0.034	0.045	−0.091
p-value	0.734	0.659	0.369

None of the correlations between arrhythmia type and the demographic variables analyzed (sex, age group, or service status) reached statistical significance (all $p>0.36$), suggesting no strong association in this sample.

Multivariate logistic regression analysis

A multivariate logistic regression model was applied to investigate independent predictors of arrhythmia within the study population. The analysis identified three statistically significant risk factors: (1) hypertension (odds ratio (OR): 2.3; 95%CI: 1.7–3.1; $p<0.01$); (2) obesity (OR: 1.8; 95%CI: 1.3–2.5; $p=0.02$); (3) work-related stress as qualitatively documented in clinical records (OR: 1.6; 95%CI: 1.2–2.1; $p=0.03$).

These findings suggest that the presence of these conditions significantly increased the likelihood of arrhythmia diagnosis among police officers, independent of other demographic characteristics. Due to the qualitative nature of stress assessment, this variable should be interpreted with caution, albeit for its consistent association with arrhythmic outcomes.

Discussion

This study identified a relatively high proportion of cardiac arrhythmias among Ecuadorian police officers, with supraventricular tachycardia emerging as the most frequent subtype. However, as these estimates are derived from a hospital-based cohort, they should not be extrapolated to the

entire police workforce. Supraventricular arrhythmias have been variably reported in the literature. For example, Skovgaard *et al*. (2022) documented a prevalence of <3% in a community-based adult cohort, markedly lower than the 27% observed in this study [21]. Such disparities may reflect both occupational exposure to stressors unique to policing and methodological differences between hospital-based and population-based studies.

Occupational stress is a central factor in arrhythmogenesis. Law enforcement personnel are repeatedly exposed to acute psychological strain, irregular shifts, and abrupt transitions from rest to exertion. Chronic activation of the sympathetic–adrenal–medullary axis reduces vagal tone and drives sustained sympathetic overactivity, elevating heart rate and blood pressure. The resulting catecholamine surges increase myocardial oxygen demand and oxidative stress, fostering endothelial dysfunction and ischemic susceptibility. Concurrently, persistent hypothalamic–pituitary–adrenal axis stimulation leads to cortisol hypersecretion, metabolic dysregulation, and heightened thromboembolic risk. These interlinked pathways create a milieu conducive to electrical instability and structural cardiac remodeling [11,13].

The present study findings align with Montece and Parrales (2021), who reported a 40% rate of paroxysmal supraventricular tachycardia in a Latin American cohort [8], supporting the influence of regional lifestyle and occupational factors. Conversely, atrial fibrillation/flutter was detected in only 11% of the present cohort, lower than the 44% reported by Rojas and Mayaguari (2020) [22]. Age distribution, exclusion of post–COVID-19 arrhythmias, and stricter diagnostic criteria may partly account for this difference.

Mechanistically, arrhythmias arise from disturbances in excitability and conduction across the sinoatrial node, atrioventricular node, His bundle, and Purkinje fibers [1,2]. These abnormalities may manifest as tachyarrhythmias or bradyarrhythmias, compromising hemodynamic stability. While supraventricular tachycardias are often considered benign, they can impair occupational performance and quality of life [6-8]. Atrial fibrillation increases thromboembolic risk and contributes to progressive ventricular dysfunction [6,22], whereas ventricular tachyarrhythmias often indicate structural heart disease and a higher risk of sudden cardiac death [8,9].

International occupational cardiology studies provide further context. Firefighters, military personnel, and air traffic controllers have all demonstrated elevated rates of arrhythmias and sudden cardiac events relative to the general population, attributable to high physical demands, environmental stressors, and disrupted circadian rhythms. The prevalence in our cohort appears comparable or higher, underscoring the need to recognize police officers as an at-risk occupational group.

In the present multivariate model, hypertension, obesity, and occupational stress emerged as independent predictors of arrhythmia. These factors are consistent with prior research, reinforcing the role of both modifiable comorbidities and psychosocial stress in arrhythmogenesis [6,8,9,12,22]. Preventive strategies should therefore extend beyond fitness standards to include structured stress management and cardiovascular risk screening tailored to the realities of policing.

Nonetheless, several limitations must be emphasized. The small sample size (n=100) reduced statistical power and increased the risk of unstable estimates in logistic regression, as reflected by some wide confidence intervals. The retrospective design precludes causal inference, and stress was assessed qualitatively from clinical notes rather than validated questionnaires, introducing potential reporting bias. Data on behavioral risk factors (e.g., alcohol, tobacco) were incomplete and excluded. Moreover, this single-center study in a demographically homogeneous group may not reflect other police populations.

Future multicenter studies with larger samples, standardized diagnostic definitions, and validated stress assessment tools (e.g., perceived stress scale, salivary cortisol, heart rate variability) are needed to refine prevalence estimates and elucidate mechanistic pathways. Integration of wearable cardiac monitoring and resilience-training programs could help clarify how occupational exposures contribute to arrhythmia onset and progression in law enforcement.

Conclusion

This retrospective exploratory study provides initial evidence of a substantial burden of cardiac arrhythmias among Ecuadorian police officers, with supraventricular tachycardia identified as the most frequent subtype. The associations observed with hypertension, obesity, and occupational stress are consistent with established pathophysiological mechanisms whereby chronic sympathetic activation, metabolic dysregulation, and haemodynamic overload increase arrhythmogenic susceptibility. These mechanisms are particularly relevant in law enforcement, where irregular schedules, high-intensity exertion, and cumulative psychosocial stressors may accelerate electrical and structural cardiac remodeling.

However, the hospital-based design, modest sample size, and reliance on clinical documentation for stress assessment limit the generalizability of the findings. Future multicentre, prospective studies with standardized diagnostic and psychosocial assessment tools are needed to better quantify arrhythmia burden in law enforcement populations. Such investigations could inform evidence-based preventive strategies, including cardiovascular screening, structured fitness programs, and occupational stress management tailored to the demands of policing.

Ethics approval

This study did not require approval from a Human Research Ethics Committee, as it was designed as a retrospective and exploratory analysis of existing medical records. No experimental interventions were performed, and no identifiable personal information was disclosed. In accordance with institutional policy, the protocol was reviewed and approved by the Teaching and Research Subdirectorate of the National Police Hospital of Guayaquil, which provided the necessary authorization for its execution.

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Competing interests

All the authors declare that there are no conflicts of interest.

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Underlying data

Derived data supporting the findings of this study are available from the corresponding author on request.

Declaration of artificial intelligence use

We hereby confirm that no artificial intelligence (AI) tools or methodologies were utilized at any stage of this study, including during data collection, analysis, visualization, or manuscript preparation. All work presented in this study was conducted manually by the authors without the assistance of AI-based tools or systems.

How to cite

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