Letter to the Editor

A sex-comparative analysis of arrhythmias in adults with acute rheumatic endocarditis in the United States

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Carditis is one of the most serious symptoms of acute rheumatic fever, presenting in 50–80% of the patient population as pancarditis, involving the pericardium, epicardium, myocardium, and particularly the endocardium, which often manifests in the form of a new onset murmur. Without appropriate treatment or regular prophylaxis, the risk of progression to rheumatic heart disease remains significantly high [1]. Arrhythmias such as atrial fibrillation affect at least 1 in every five patients, consequently increasing the mortality due to cardiac arrest and stroke [2]. Extensive literature exists analyzing the progression of symptoms and increased incidence of recurrence in pregnant females, but limited data are available comparing arrhythmia types and their subsequent complications between males and non-pregnant females.

We embarked on this retrospective analysis to identify sex-specific disparities in arrhythmias in adults with acute rheumatic endocarditis (ARE). Data were extracted from the National Inpatient Sample (NIS), compiled and released by the Healthcare Cost and Utilization Project (HCUP), using the ICD-10 code I01.1 from the years 2016–2020 [3]. The study excluded all patients aged < 18 years. Various patient characteristics and cardiac arrhythmias were identified in the database, as previously used in other studies [4]. The primary goal of this analysis was to determine the sex-specific prevalence of different arrhythmias using the multivariable regression model. Secondary objectives included calculating the differences between the duration of hospital stay, the incidence of cardiogenic shock, and all-cause mortality between the two genders. The study relied on the use of SPSS 29.0 (IBM Corp., Armonk, NY), and

Table I. Baseline characteristics of hospitalized patients as extracted from National Inpatient Database 2016–2020

Parameter	Male	Female	*P*-value
Age [years]	58.99	53.81	< 0.01
Length of hospital stay [days]	13.11	11.53	< 0.01
Charges [dollars]	184,297.78	135,221.55	< 0.01

as the data did not contain any patient-identifiable information, the need for IRB approval was waived. Variables with frequency < 11 had to be excluded due to preventing breach of anonymity as per HCUP rules.

The data yielded a total number of 3425 patients, the majority of whom, that is 52.26% (1790), were females, with the remaining 47.7% (1635) being males. In addition, males were older than females (mean age of 58.99 vs. 53.81 years in males, $p < 0.01$), and reported a higher mean Charlson Comorbidity Index (CCI) score (4.12 vs. 3.90, $p < 0.01$). The study demonstrated that females were significantly less likely to report events of atrial fibrillation (adjusted odds ratio (aOR) = 0.683, 95% confidence interval (CI): 0.561–0.831, $p < 0.001$), atrial flutter (aOR = 0.248, 95% CI: 0.156–0.393, $p < 0.001$), and complete atrioventricular (AV) block (aOR = 0.172, 95% CI: 0.076–0.387, $p < 0.001$). In addition, females had a shorter duration of hospitalization (11.5 vs. 13.1 days, $p < 0.01$) and lower mean hospital charges ($p < 0.01$) (Table I). However, the likelihood of supraventricular tachycardia was noted to be much higher in females than in males (aOR = 2.479, 95% CI: 1.112–5.528, $p = 0.026$). The results did not show any substantial disparity in the prevalence of ventricular tachycardia between the two sexes. The incidence of cardiogenic shock was found to be notably higher in females (aOR = 1.489, 95% CI: 1.016–2.182, $p = 0.041$), even though the overall mortality in females was lower (aOR = 0.749, 95% CI: 0.570–0.985, $p = 0.039$) (Table II).

Regarding cardiogenic shock, it was interesting to note that similar occurrences were also observed in women suffering from acute myocardial infarction in a study conducted by Vogel *et al*. [5].

The variance observed in mortality rates, length of hospital stays, and type of arrhythmias in males and females suffering from ARE, according to this study, may be a stepping stone to initiating thorough assessment and re-evaluation of guidelines for the treatment and screening of those affected by ARE. A "risk vs benefit" measure for each patient can be used to assess the need for anticoagulation, which will play a pivotal role in reducing the risk of stroke associated with cardiac arrhythmias due to ARE. Not only that, but decreased hospital stays, and hence the preservation of medical resources, in the case of females should also be carefully analyzed to rule out the presence of any confounders. Further studies should be conducted to correlate the responsible factors and develop strategies to decrease the length of hospitalization in men. This will lead not only to overall improvement of healthcare but also to equitable use of resources, which can have significant benefits in the long run.

While interpreting the results of the study, it is important to keep potential limitations in mind. For instance, the data collected for this study concerned hospitalized symptomatic patients and did not represent the whole population. Baseline characteristics were not controlled in the study, leaving room for bias. Similarly, an increased risk of various arrhythmias could be associated with the higher age of male patients in the study sample. Finally, misclassification bias could not be ruled out, being inherent to such large databases.

In conclusion, this study showed an apparent sex-based disparity in the types of arrhythmias, mortality, and hospital stays. The results of this study can bring numerous positive changes in the treatment of ARE-induced arrhythmias and their complications to improve the overall patient prognosis. However, the risk of bias should first be as-

Table II. Adjusted odds ratio of primary and secondary endpoints in females as compared to males (reference for male OR of 1)

Arrhythmia	Adjusted odds ratio	Lower 95% CI	Upper 95% CI	*P*-value
Atrial fibrillation	0.683	0.561	0.831	< 0.001
Supraventricular tachycardia	2.479	1.112	5.528	0.026
Ventricular tachycardia	0.596	0.397	0.894	0.012
Ventricular fibrillation	1.233	0.732	2.078	0.431
Atrial flutter	0.248	0.156	0.393	< 0.001
Complete AV block	0.172	0.076	0.387	< 0.001
Cardiogenic shock	1.489	1.016	2.182	0.041
Death	0.749	0.570	0.985	0.039

sessed before making any significant changes in the treatment and screening protocols.

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Ethical approval

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

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