



Atrial fibrillation after vaccination for COVID-19: analysis of the vaccine adverse event reporting system

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Abbreviations

USA	United States of America
VAERS	Vaccine Adverse Event Reporting System
AF	Atrial fibrillation
CDC	Centers for Disease Control and Prevention
FDA	Food and Drug Administration

Almost 250 million people in the USA have received at least one dose of a COVID-19 vaccination, as of mid-January 2022. The vast majority have received vaccines from three manufacturers—Pfizer/BioNTech, Moderna, and Johnson & Johnson.

There remains significant hesitancy surrounding the vaccine, with concerns regarding adverse effects featuring prominently. Minor adverse effects, such as fatigue, myalgia, headache, and chills are quite common, while severe adverse effects are rare and reportedly more common in those receiving the Moderna vaccine (compared to Pfizer/BioNTech), females, and those with prior COVID-19 infection [1].

While cardiac adverse events are reportedly uncommon, there remains limited data on atrial fibrillation (AF) after receiving COVID-19 vaccination [2, 3]. So, we sought to analyze publicly available data from the Vaccine Adverse Event Reporting System (VAERS) to determine the

incidence and factors associated with AF after COVID-19 vaccination.

VAERS is a national warning system, managed by the Centers for Disease Control and Prevention (CDC) and the U.S. Food and Drug Administration (FDA) and represents post-licensure vaccine safety monitoring in the USA. We extracted data from VAERS till January 7, 2022, and analyzed all reported events of AF after COVID-19 vaccination. Pfizer-BioNTech COVID-19 vaccine was made available under emergency use authorization starting December 11, 2020, Moderna COVID-19 vaccine starting December 18, 2020, and Johnson & Johnson COVID-19 vaccine starting February 27, 2021. The total doses of COVID-19 vaccine administration were obtained from the CDC website.

A total of 2611 events of AF were reported after COVID-19 vaccination, of which, 315 were new-onset AF. As of January 7, 2022, a total of 523.12 million COVID-19 vaccine doses were administered, making the incidence of atrial fibrillation around 5 per million COVID-19 vaccine doses administered. Of this, 1328 events were in males, and 1245 were in females. The vast majority were patients ≥ 40 years old. Furthermore, 1133 were after the first dose, with 1214 following the second dose of the COVID-19 vaccine. A similar proportion of events were reported both within 1 week of receiving the vaccine, and after 1 week of receiving it (Table 1). For comparison, 12 events of AF were reported after vaccination for the influenza virus (Quadrivalent), in the year 2021, as reported in the VAERS database, from a total of 193.8 million influenza vaccines that were administered in the same year.

Overall, the incidence of AF was low in those receiving COVID-19 vaccination. A similar incidence of AF was found after vaccination with Pfizer/ BioNTech and Moderna. The phase III trials of each major COVID-19 vaccine reported an extremely low incidence of AF [2, 3]. Further, in an analysis of the WHO pharmacovigilance post-marketing database—VigiBase, the authors reported only 35 events of AF, among 5000 adverse cardiovascular effects attributed to the COVID-19 vaccination [4]. However, none reported

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Table 1 Events of atrial fibrillation post COVID-19 vaccination as reported in VAERS

All atrial fibrillation (2611)		
Johnson & Johnson	191	7.32%
Moderna	1319	50.52%
Pfizer/BioNTech	1433	54.88%
New-onset atrial fibrillation (315)		
Johnson & Johnson	29	9.21%
Moderna	149	47.30%
Pfizer/BioNTech	190	60.32%
Male (1328)		
Johnson & Johnson	94	7.08%
Moderna	690	51.96%
Pfizer/BioNTech	730	54.97%
Female (1245)		
Johnson & Johnson	93	7.47%
Moderna	613	49.24%
Pfizer/BioNTech	681	54.70%
Less than or equal to 7 days for atrial fibrillation onset since vaccination (1242)		
Johnson & Johnson	71	5.72%
Moderna	594	47.83%
Pfizer/BioNTech	639	51.45%
More than 7 days for atrial fibrillation onset since vaccination (1213)		
Johnson & Johnson	93	7.67%
Moderna	672	55.40%
Pfizer/BioNTech	717	59.11%
Following the first dose (1133)		
Johnson & Johnson	132	11.65%
Moderna	514	45.37%
Pfizer/BioNTech	499	44.04%
Following the second dose (1214)		
Johnson & Johnson	4	0.33%
Moderna	562	46.29%
Pfizer/BioNTech	655	53.95%
Age less than 40 (128)		
Johnson & Johnson	14	10.94%
Moderna	51	39.84%
Pfizer/BioNTech	80	62.50%
Age equal to or more than 40 (2360)		
Johnson & Johnson	166	7.03%
Moderna	1227	51.99%
Pfizer/BioNTech	1282	54.32%

VAERS, Vaccine Adverse Event Reporting System

further details regarding the characteristics of AF. We found a similarly low incidence of AF, regardless of sex, and a similar incidence between the different types of COVID-19 vaccine. We found that older vaccine recipients were more likely to have AF. Given that AF is relatively common among those hospitalized with COVID-19, with a prevalence of around 10%, the low incidence of AF in patients receiving vaccines for COVID-19 is reassuring [5].

Our study has limitations. Firstly, the VAERS database does not report the total doses of vaccine administered for each adverse event reported; hence, presentation of the results as adverse events per doses administered in subcategories was not possible. Furthermore, there remains the possibility of overreporting or underreporting of atrial fibrillation among individuals receiving COVID-19 and influenza vaccines, considering VAERS is a passive reporting system. Information on prior COVID-19 infection and conventional risk factors for AF are unavailable in the VAERS database. Finally, an individual could have received two types of vaccines, and hence the percentages add up to over 100%, both overall and in each subgroup.

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