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Adverse events following COVID-19 mRNA vaccines: A systematic review of cardiovascular complication, thrombosis, and thrombocytopenia

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Abstract

Background and objectives: Since publishing successful clinical trial results of mRNA coronavirus disease 2019 (COVID-19) vaccines in December 2020, multiple reports have arisen about cardiovascular complications following the mRNA vaccination. This study provides an in-depth account of various cardiovascular adverse events reported after the mRNA vaccines' first or second dose including pericarditis/myopericarditis, myocarditis, hypotension, hypertension, arrhythmia, cardiogenic shock, stroke, myocardial infarction/STEMI, intracranial hemorrhage, thrombosis (deep vein thrombosis, cerebral venous thrombosis, arterial or venous thrombotic events, portal vein thrombosis, coronary thrombosis, microvascular small bowel thrombosis), and pulmonary embolism.

Methods: A systematic review of original studies reporting confirmed cardiovascular manifestations post-mRNA COVID-19 vaccination was performed. Following the PRISMA guidelines, electronic databases (PubMed, PMC NCBI, and Cochrane Library) were searched until January 2022. Baseline characteristics of patients and disease outcomes were extracted from relevant studies.

Results: A total of 81 articles analyzed confirmed cardiovascular complications post-COVID-19 mRNA vaccines in 17,636 individuals and reported 284 deaths with any mRNA vaccine. Of 17,636 cardiovascular events with any mRNA vaccine, 17,192 were observed with the BNT162b2 (Pfizer-BioNTech) vaccine, 444 events with mRNA-1273 (Moderna). Thrombosis was frequently reported with any mRNA vaccine (n = 13,936), followed by stroke (n = 758), myocarditis (n = 511), myocardial infarction (n = 377), pulmonary embolism (n = 301), and arrhythmia (n = 254). Stratifying the results by vaccine type showed that thrombosis (80.8%) was common in the BNT162b2 cohort, while stroke (39.9%) was common with mRNA-1273 for any dose. The time between the vaccination dosage and the first symptom onset averaged 5.6 and 4.8 days with the mRNA-1273 vaccine and BNT162b2, respectively. The mRNA-1273 cohort reported 56 deaths compared to the 228 with BNT162b2, while the rest were discharged or transferred to the ICU.

Conclusion: Available literature includes more studies with the BNT162b2 vaccine than mRNA-1273. Future studies must report mortality and adverse cardiovascular events by vaccine types.

Keywords: COVID-19 vaccines; Pfizer–BioNTech; SARS-CoV-2; cardiovascular complications; genes; infection; public health.

Conflict of interest statement

The authors declare no conflict of interest.

Figures

Figure 1 PRISMA flow chart of studies...

Figure 2 Cardiac and vascular events observed...

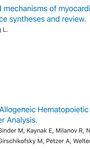

Figure 3 Cardiac and vascular events observed...

Figure 4 Treatment options of cardiovascular

Figure 5 Treatment options of cardiovascular

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